THE

# Malayan Agricultural Journal.

AUGUST, 1936.

## EDITORIAL.

**Padi Soils.**

Accounts have appeared in previous issues of this Journal of examinations of padi soils, and in this number we print an article by Mr. J. H. Dennett, Soils Chemist, in which a description is given of experiments on a small scale designed to yield information regarding the losses of nitrogen and phosphates from padi soils under anaerobic conditions. This article with its accompanying graphs gives the results of observations made on two padi soils kept under water for a period of nine months.

**Derris.**

Variability in the toxic content of consignments of Derris roots, and the growing competition from plants yielding similar toxic substances have, in no small measure, had a detrimental effect on the extended use of Derris as an insecticide. Manufacturers of insecticides are apparently still of two opinions regarding the standards by which the toxicity of Derris should be estimated, some of them insisting that the roots should have a high rotenone content and others demanding roots with a high ether extract. In either case, it is hardly necessary to stress the importance of being able to guarantee the toxic content of a consignment of Derris root within reasonably narrow limits.

It is true that, in certain cases, variability in the toxic content may have been the outcome of a mixture of varieties in consignments which purported to be composed of one variety only in which the toxic content was known to be of a certain order.

The investigations described in an article published in this issue were undertaken with a view to determine by chemical analysis the variations in toxic content in the root systems of individual plants, so that from plants in which the ether extract and the rotenone content are found to be relatively stable the isolation of clonal types for future propagation can be effected. As pointed out by the authors of this article, a factor of equal, if not greater, importance is the yield of marketable root per plant. This aspect of the problem is essentially an agricultural one, and the reader is referred to an article which appeared in the *Malayan Agricultural Journal* for June 1935, in which were described experiments, carried out to throw some light on the extent to which the yield of root of different species of Derris might be affected by artificial fertilizers.

A prominent fact which emerges from the increasing attention which is being devoted to Derris or "tuba" is the need for a thorough investigation into the classification of the members of this genus. In an article by Mr. J. N. Milsum, Acting Agriculturist, entitled "Derris Cultivation in Perak", which we reproduce in this number, a description is given of the cultivation in Perak of a type of plant which is considered by the author of the article to be referable to *Derris malaccensis*, but which, on more detailed examination may prove to be a distinct species. Roots of this type have been analysed and have been found to contain a moderately high percentage of ether extract and a very low percentage of rotenone. These are characteristics of *Derris malaccensis* Prain var. *sarawakensis* Henderson, but the Perak type, to which the author refers as the "Kinta type", differs in habit from *D. malaccensis* var. *sarawakensis*. These observations again point to the complexity of the classification of this genus of useful plants.

**Carpet Grass.** The investigations described in the article by Major C. D. V. Georgi, Agricultural Chemist, into the chemical composition of carpet grass grown at the Central Experiment Station, Serdang, owe their origin to the fact that carpet grass is not greatly relished by cattle. The results of the investigations show that the lesser palatability of carpet grass may be due to the fact that the grass has a lower crude protein content and lower moisture content during dry weather than the more relished guinea grass.

## Original Articles.

# THE LOSS OF PHOSHATES AND AMMONIA FROM PADI SOILS KEPT IN THE LABORATORY UNDER ANAEROBIC CONDITIONS

BY
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Reference has been made in the annual reports of the Division of Soils and Plant Physiology for 1934 and 1935 to the losses of nitrogen and phosphates from padi soils under anaerobic conditions.

Below are given the results of observations, made in the laboratory over a period of nine months, on two padi soils kept under water. Each of these soils had a series of varying quantities of ammonium sulphate and superphosphate added to them and the amount of these substances lost each week was recorded.

Two kilograms of soil from the Test Station at Selinsing, Perak, were placed in each of fourteen winchester quart bottles and to these were added superphosphate and ammonium sulphate each at the following rates per acre:—

Control, 2 cwt., 5 cwt., 10 cwt., 20 cwt., 30 cwt., and 40 cwt.; in all seven lots, each in duplicate. Selinsing is a normal-yielding soil; in terms of padi, capable of yielding about 400 gantangs per acre.

A similar series was prepared with a soil, from Balik Pulau, Penang Island, capable of yielding 1,000 gantangs.

The soils were covered with tap water to a depth of about two inches and samples of 300 cc.* were removed daily. These were bulked and the phosphate and ammonia content estimated at weekly intervals.

### Ammonia Losses.

The results of the grand total of ammonia are shewn graphically to demonstrate the increases in ammonia lost with increases in quantities added, and also to illustrate the larger losses obtained with the richer soil, suggesting that loss and immediate availability are possibly closely related.

In the tables are shewn actual amounts, in grams, of ammonia added (as sulphate) and monthly amounts lost in milligrams.

It is to be noted that the loss from the Selinsing soil without any added ammonia is at the rate of $1\frac{1}{2}$ cwt. ammonium sulphate per acre † over the nine months, while in the case of the Penang soil this loss on the control is rather over 3 cwt. Where manures are added the loss with 2 cwt. is much the same as the control, rising with the heavier dressings to between 20 and 25 per cent. of the amount added in the case of Selinsing and 25 and 30 per cent. in the case of Penang soil.

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* A quantity proportional to the general flow rate for irrigated padi. (1 cu. foot of water per 50 acres per second).

† Using the conventional conversion factor of 1,000,000 kilograms per acre-foot = approximately 1,000 tons.

The table gives the mean figures. The duplicates only differ from the mean by about 5 per cent.

**Loss of Phosphates.**

A study of the loss of phosphates shews a rather different position. For the control in the case of Selinsing the loss is only at the rate of about 18 lbs. of superphosphate per acre over the nine months and in the case of Penang about 75 lbs. At the maximum dressing of 40 cwt. the losses are respectively 40 lbs. and 230 lbs.

The figures in the table again represent means of the duplicates but here the accuracy of the means is not so great, variations occasionally being as much as 50 per cent. of the mean.

From the graphs it will be seen that nearly all of the superphosphate is adsorbed in the case of Selinsing soil and that even in the case of Penang soil, although the loss is five or six times as much, the tendency towards increased losses with heavier dressings is comparatively small, a point which has a bearing on the results described elsewhere in the *Malayan Agricultural Journal* * in connexion with pot padi experiments.

**Monthly Decreases in Losses.**

(a) Ammonia.

An interesting point is the gradual decreases in the losses from month to month, so that at the end of nine months there is a tendency for all losses to become the same, irrespective of the amount of manure added or the type of soil concerned.

The tables and the graphs apply to soils which were not aerated; it was found that if aerated water was continuously supplied and run off, the losses of ammonia decreased more rapidly and that at the end of four months nitrates might be present in the run-off water.

(b) Phosphate.

In this case the maximum loss was found at the end of the second month, and although there is a tendency for losses to decrease, the decrease is at a much smaller rate than for ammonia and there is some tendency for losses to be periodic.

It appears probable that there is a gradual decrease in available nitrogen as ammonia throughout a growing season, while the available phosphate is possibly more evenly distributed. Further, it seems likely, in view of the tendency for ammonia losses to become equal irrespective of the amount of manure added, that there is considerable loss of nitrogen as nitrogen gas.

Finally it must be remembered that the conditions are not the same as field conditions of growing padi, this investigation being an attempt to get at the order of possible losses without the complication of the plant factor. In point of fact, much of the "losses" here shown may not occur under growing padi but it seems not unlikely that these losses are representative of amounts available to the plant.

* Vol. XXIV, July, 1936. p. 309 *et seq.*

## Table I.

## Ammonia in Leachings.

## 1935.

| | Soil | March mg. | April mg. | May mg. | June mg. | July mg. | August mg. | Sept. mg. | Oct. mg. | Nov. mg. | Grand Total mg. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Selinsing Soil* | | | | | | | | | | |
| 1. | Control. | 1.44 | 4.09 | 2.92 | 2.60 | 3.02 | 1.59 | 1.96 | 1.26 | 1.14 | 19.52 |
| 2. | 0.163 gms. ammonium sulphate<br>0.163 „ superphosphate = 2 cwt. | 3.58 | 5.52 | 3.52 | 2.92 | 3.14 | 1.00 | 0.84 | — | 0.86 | 21.38 |
| 3. | 0.407 „ ammonium sulphate<br>0.407 „ superphosphate = 5 cwt. | 8.59 | 6.67 | 6.18 | 3.64 | 4.16 | 3.00 | 3.58 | 1.84 | 0.84 | 37.58 |
| 4. | 0.815 „ ammonium sulphate<br>0.815 „ superphosphate = 10 cwt. | 16.16 | 15.62 | 5.28 | 3.52 | 2.92 | 1.68 | 1.94 | 1.12 | 1.16 | 49.40 |
| 5. | 1.63 „ ammonium sulphate<br>1.63 „ superphosphate = 20 cwt. | 33.14 | 32.04 | 7.72 | 6.36 | 4.52 | 3.35 | 2.51 | — | 0.76 | 91.95 |
| 6. | 2.45 „ ammonium sulphate<br>2.45 „ superphosphate = 30 cwt. | 48.76 | 33.86 | 12.12 | 9.40 | 5.66 | 3.65 | 3.93 | — | 0.76 | 118.16 |
| 7. | 3.26 „ ammonium sulphate<br>3.26 „ superphosphate = 40 cwt. | 62.98 | 45.24 | 15.36 | 14.65 | 8.92 | 5.40 | 5.10 | 1.84 | 1.14 | 159.71 |

## Table I *(Cont.)*

## Ammonia in Leachings.

## 1935.

| | Soil | March mg. | April mg. | May mg. | June mg. | July mg. | August mg. | Sept. mg. | Oct. mg. | Nov. mg. | Grand Total mg. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Penang Soil* | | | | | | | | | | |
| 1. | Control. | 8.98 | 11.64 | 6.06 | 7.44 | 8.76 | 2.64 | 3.72 | 1.96 | 1.14 | 51.02 |
| 2. | 0.163 gms. ammonium sulphate<br>0.163 „ superphosphate = 2 cwt. | 10.65 | 13.68 | 8.40 | 7.48 | 4.49 | 1.58 | 1.68 | 0.64 | 0.40 | 48.98 |
| 3. | 0.407 „ ammonium sulphate<br>0.407 „ superphosphate = 5 cwt. | 18.96 | 19.32 | 10.96 | 6.36 | 3.72 | — | 0.72 | — | 0.20 | 60.16 |
| 4. | 0.815 „ ammonium sulphate<br>0.815 „ superphosphate = 10 cwt. | 26.52 | 19.62 | 10.80 | 9.00 | 7.18 | — | 1.08 | — | 0.28 | 74.60 |
| 5. | 1.63 „ ammonium sulphate<br>1.63 „ superphosphate = 20 cwt. | 43.43 | 39.00 | 15.40 | 11.56 | 9.60 | 0.20 | 1.56 | 1.84 | 0.76 | 122.75 |
| 6. | 2.45 „ ammonium sulphate<br>2.45 „ superphosphate = 30 cwt. | 50.00 | 43.10 | 23.28 | 7.40 | 2.60 | 0.80 | 1.56 | 1.96 | 0.66 | 131.39 |
| 7. | 3.26 „ ammonium sulphate<br>3.26 „ superphosphate = 40 cwt. | 88.02 | 61.80 | 21.34 | 14.73 | 9.62 | 1.22 | 1.80 | 1.40 | 1.52 | 201.55 |

## Table II.

## $P_2O_5$ in Leachings.

## 1935.

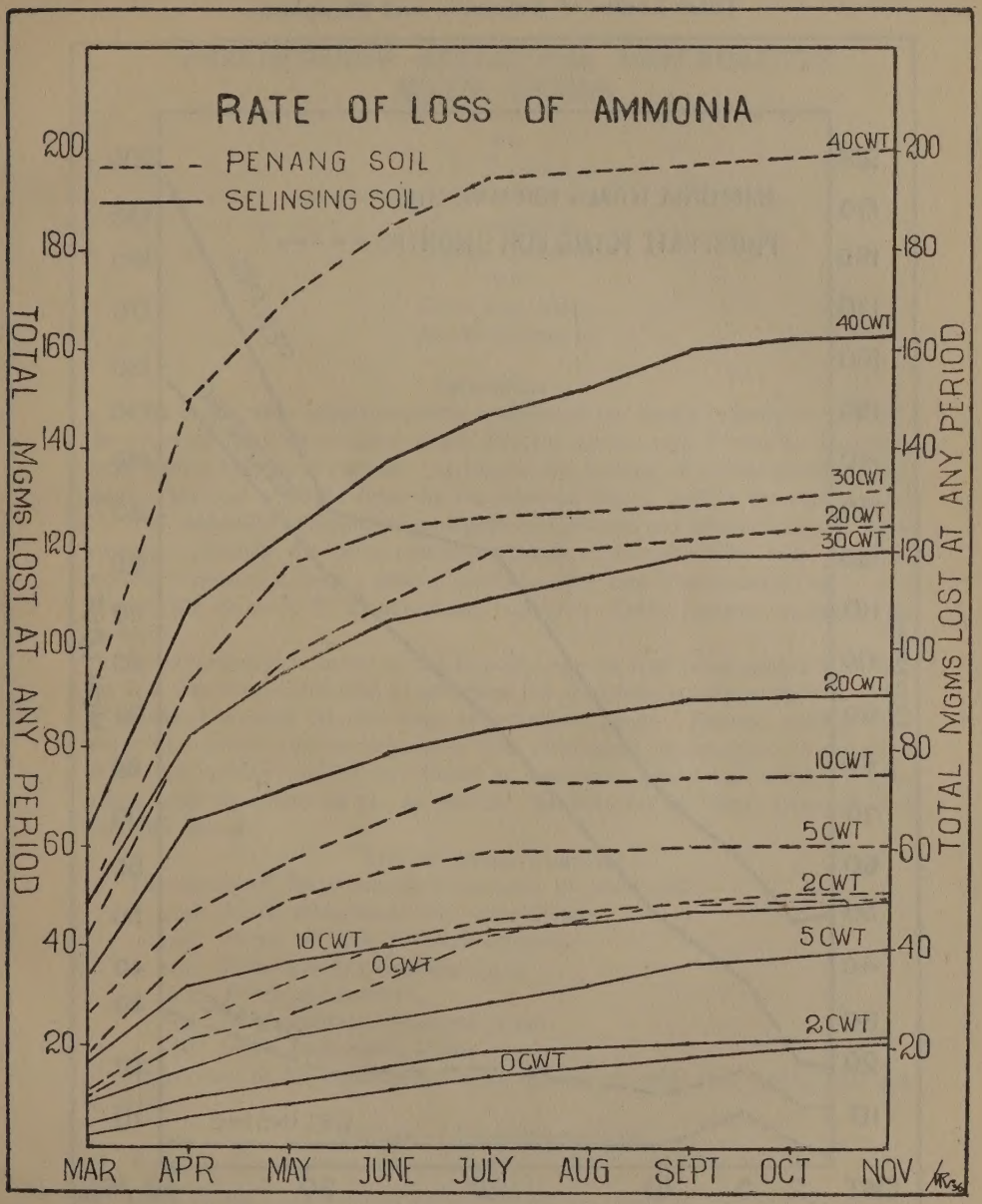
| | Soil | March mg. | April mg. | May mg. | June mg. | July mg. | August mg. | Sept. mg. | Oct. mg. | Nov. mg. | Grand Total mg. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Selinsing Soil* | | | | | | | | | | |
| 1. | Control. | 0.425 | 0.516 | 0.396 | 0.131 | 0.200 | 0.198 | 0.511 | 0.232 | 0.110 | 2.768 |
| 2. | 0.163 gms. ammonium sulphate<br>0.163 „ superphosphate = 2 cwt. | 0.222 | 0.276 | 0.310 | 0.112 | 0.175 | 0.078 | 0.318 | 2.590 | 0.099 | 4.180 |
| 3. | 0.407 „ ammonium sulphate<br>0.407 „ superphosphate = 5 cwt. | 0.290 | 0.295 | 0.223 | 0.107 | 0.176 | 0.068 | 0.336 | 10.168 | 0.142 | 11.806 |
| 4. | 0.815 „ ammonium sulphate<br>0.815 „ superphosphate = 10 cwt. | 0.326 | 0.228 | 0.324 | 0.120 | 0.170 | 0.069 | 0.334 | 1.523 | 1.122 | 4.217 |
| 5. | 1.63 „ ammonium sulphate<br>1.63 „ superphosphate = 20 cwt. | 0.232 | 0.146 | 0.553 | 0.127 | 0.323 | 0.066 | 0.210 | 0.654 | 0.999 | 3.315 |
| 6. | 2.45 „ ammonium sulphate<br>2.45 „ superphosphate = 30 cwt. | 0.361 | 0.187 | 0.413 | 0.170 | 0.652 | 0.054 | 0.285 | 1.794 | 2.104 | 6.022 |
| 7. | 3.26 „ ammonium sulphate<br>3.26 „ superphosphate = 40 cwt. | 0.449 | 0.395 | 0.384 | 0.200 | 1.130 | 0.105 | 0.214 | 2.491 | 1.250 | 6.022 |

## Table II *(Cont.)*

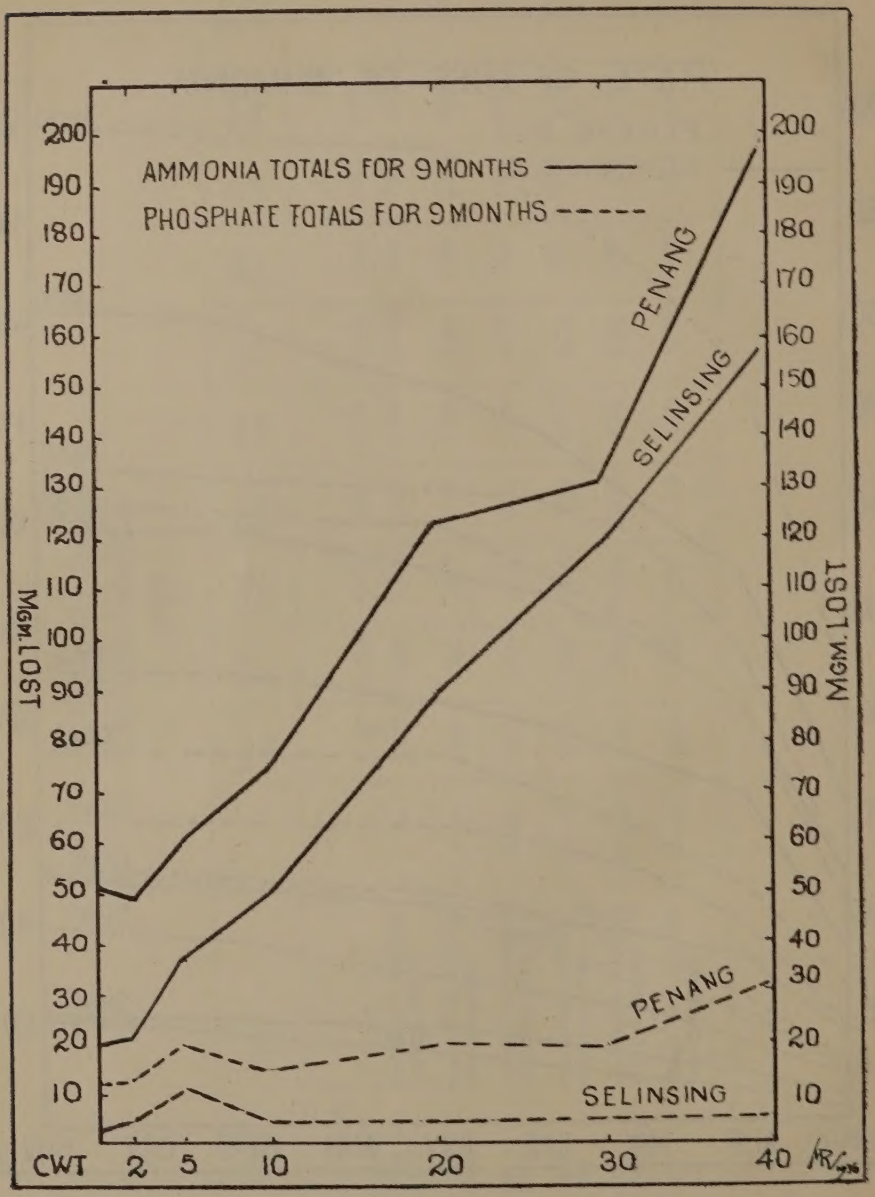
## $P_2O_5$ in Leachings.

## 1935.

| | Soil | March mg. | April mg. | May mg. | June mg. | July mg. | August mg. | Sept. mg. | Oct. mg. | Nov. mg. | Grand Total mg. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Penang Soil* | | | | | | | | | | |
| 1. | Control. | 1.193 | 3.103 | 0.837 | 0.513 | 0.412 | 0.198 | 3.523 | 1.482 | 0.300 | 11.562 |
| 2. | 0.163 gms. ammonium sulphate<br>0.163 „ superphosphate = 2 cwt. | 2.372 | 4.099 | 0.755 | 0.335 | 0.483 | 0.570 | 2.001 | 1.480 | 0.505 | 12.601 |
| 3. | 0.407 „ ammonium sulphate<br>0.407 „ superphosphate = 5 cwt. | 3.337 | 4.941 | 2.062 | 0.763 | 1.267 | 0.880 | 1.986 | 2.383 | 2.507 | 20.069 |
| 4. | 0.815 „ ammonium sulphate<br>0.815 „ superphosphate = 10 cwt. | 2.152 | 3.799 | 1.202 | 0.533 | 1.247 | 0.578 | 1.952 | 1.268 | 1.959 | 14.641 |
| 5. | 1.63 „ ammonium sulphate<br>1.63 „ superphosphate = 20 cwt. | 4.007 | 6.207 | 1.300 | 0.506 | 1.865 | 0.334 | 3.274 | 2.812 | 0.267 | 20.123 |
| 6. | 2.45 „ ammonium sulphate<br>2.45 „ superphosphate = 30 cwt. | 5.261 | 4.968 | 1.669 | 0.609 | 1.316 | 0.522 | 2.307 | 1.515 | 1.409 | 19.576 |
| 7. | 3.26 „ ammonium sulphate<br>3.26 „ superphosphate = 40 cwt. | 4.956 | 9.482 | 3.919 | 1.412 | 3.343 | 1.796 | 1.438 | 5.403 | 1.498 | 32.731 |


RATE OF LOSS OF AMMONIA
PENANG SOIL
SELINSING SOIL
TOTAL MGMS LOST AT ANY PERIOD
TOTAL MGMS LOST AT ANY PERIOD
200
180
160
140
120
100
80
60
40
20
40CWT
40CWT
30CWT
20CWT
30CWT
20CWT
10CWT
5CWT
2CWT
10CWT
0CWT
5 CWT
2CWT
0CWT
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV

Total Losses of Ammonia and Phosphate.



# PRELIMINARY SELECTION EXPERIMENTS WITH DERRIS

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## Introductory.

One of the more urgent problems confronting the Derris industry at present is the necessity for a close study of the different species with a view to developing types with a high toxic content. At present the toxicity of a commercial consignment of the root is judged either by the rotenone content and or the ether extract.

The variability in quality of consignments has been one of the principal reasons adversely affecting the development of Derris as an insecticide and, now that growing competition from a similar product—cubé root (*Lonchocarpus* sp.)—must be met. the necessity for standardizing high-grade Derris becomes of greater importance.

A comprehensive survey of the principal species now being grown in Malaya has therefore been undertaken to determine the variations in toxic content as shown by chemical analysis between roots of individual plants. Further. cuttings from plants of superior toxic content have been established to ascertain the degree to which this quality can be reproduced in successive generations of the original plants. and to ensure as far as possible the isolation of clonal types of each desirable species.

## List of Species Examined.

The species of Derris examined included the following:—

(a) *Derris malaccensis* var. *sarawakensis.*
(b) *Derris elliptica,* Sarawak creeping.
(c) *Derris elliptica* (Serdang type).
(d) *Derris polyantha*?*.
(e) *Derris elliptica* (Singapore type).
(f) *Derris malaccensis* (Kinta type).

An account of the experimental work carried out with each species will now be given.

## Outline of Experimental Work.

(a) *Derris malaccensis* var. *sarawakensis.*

Forty plants, aged between 24 and 25 months, were selected at random in a plot at the Central Experiment Station, Serdang. The stems of each plant were

* The botanical identification of this species must be regarded as doubtful.

removed and reserved for the purpose of striking cuttings, while the whole of the root system of each plant was lifted.

The roots were washed free from adhering soil, dried and the "fine" or marketable roots separated. The weights of the air-dry roots were recorded in each case.

Analysis was restricted to a determination of the ether extract. Subsequently, rotenone estimations were carried out on four samples selected at random to obtain an indication of the extent of the variation existing between rotenone and ether extract for this species.

The weights of marketable roots for the individual plants, calculated on a moisture-free basis, varied from 7.79 to 1.14 ozs. with an average of 3.89 ozs.

The figures for ether extract, calculated on a moisture-free basis, varied from 25.65 to 6.13 per cent., the average figure being 19.44 per cent.

Table I, in which the figures are divided into groups of 1 per cent., affords a better indication of the frequency of variation.

## Table I.

**Species - *Derris malaccensis* var. *sarawakensis*.**

**Ether Extract of Marketable Roots from Individual Plants at Serdang arranged in Groups of 1 per cent.**

| Ether Extract (moisture-free basis) | No. of Samples. |
|---|---|
| per cent. | |
| 26 — 25 | 1 |
| 25 — 24 | — |
| 24 — 23 | 2 |
| 23 — 22 | 6 |
| 22 — 21 | 8 |
| 21 — 20 | 7 |
| 20 — 19 | 4 |
| 19 — 18 | 4 |
| 18 — 17 | 1 |
| 17 — 16 | 2 |
| 16 — 15 | — |
| 15 — 14 | 1 |
| 14 — 13 | 1 |
| Below 13 | 3 |
| | Total 40 |

Excluding the figures in the 20 to 19 group, which will include the average figure of 19.44 per cent. for all the plants, the results indicate that there are 24 plants in which the ether extract of the root system is above the average, and 12 plants in which it is below the average.

The results of the rotenone determinations, which are summarized in Table II, indicate that for this species of Derris the proportion of rotenone to ether extract is approximately 15 per cent.

## Table II.

**Relationship between Rotenone Content and Ether Extract for Roots of *Derris malaccensis* var. *sarawakensis*.**

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| 5 | 2.73 | 21.07 | 13.0 |
| 9 | 4.29 | 25.65 | 16.7 |
| 19 | 3.26 | 21.89 | 14.9 |
| 22 | 3.04 | 21.40 | 14.2 |
| | | Average | 14.7 |

In the selection of planting material with a view to the cultivation of the crop under estate conditions, a factor of equal if not greater importance than the toxic content is the yield of marketable root per plant. Thus, in the case of root being sold on a basis of ether extract, a plant yielding 8 ozs. of root with an ether extract of 18 per cent. is more valuable than one yielding 4 ozs. of root in which the ether extract may amount to 24 per cent. In the former case the toxicity of the root system, that is the product of the yield of root and its ether extract, will amount to 1.44 ozs.; in the latter case it is only 0.96 ozs.

In the present investigation, however, it was not considered fair to base the final selection of planting material on figures for the toxicities of the root systems, since in many cases the plants had been spaced too closely and some of those lifted may not have developed properly as regards their root systems. Accordingly the final selection was based on the amount of ether extract, the first 20 plants in order of merit being selected for propagating purposes. The ether extract of the root systems varied from 25.65 to 20.66 per cent., the minimum figure being therefore approximately 1 per cent. above the average.

From the point of view of ether extract the results of analysis of the roots from Serdang must be regarded as disappointing. Compared with previous figures for samples of root from a mixed stock of this species also cultivated at Serdang (1) the average figure of 19.44 per cent. is low. In this connexion it may be mentioned that a figure of 19.44 per cent., calculated on a moisture-free basis, corresponds to 17.50 per cent. on an air-dry (10 per cent. moisture) basis, which

is slightly below the standard figure of 18 per cent. on which the toxic content of roots sold on an ether extract basis is usually fixed.

A further search for high-grade planting material was therefore made. Since previous results of analysis for a sample of root from a mixed stock of this species growing on the Experimental Plantation, Kuala Lumpur, had shown an ether extract of over 27 per cent., calculated on a moisture-free basis (2), the root systems of all the plants of this species at present under cultivation at Kuala Lumpur were analysed.

Forty-seven plants, aged about 36 months, were taken for the experiment. The same procedure as regards separation of roots and their analysis was followed as in the case of the material from Serdang.

Unfortunately the plants had been spaced too closely so that growth was poor and yields of marketable root per plant were low. The figures for marketable root, calculated on a moisture-free basis, ranged from 1.46 to 0.06 ozs. with an average of 0.36 ozs.

Figures for ether extract calculated on a similar basis, varied from 26.83 to 14.78 per cent. with an average of 21.31 per cent.

Table III, in which the figures for ether extract are divided into groups of 1 per cent., indicates the frequency of variation.

## Table III.

**Species - *Derris malaccensis* var. *sarawakensis*.**

**Ether Extract of Marketable Roots from Individual Plants at Kuala Lumpur arranged in Groups of 1 per cent.**

| Ether Extract (moisture-free basis) | No. of Samples |
|---|---|
| per cent. | |
| 27 — 26 | 1 |
| 26 — 25 | 5 |
| 25 — 24 | 2 |
| 24 — 23 | 5 |
| 23 — 22 | 6 |
| 22 — 21 | 8 |
| 21 — 20 | 6 |
| 20 — 19 | 2 |
| 19 — 18 | 7 |
| 18 — 17 | 1 |
| 17 — 16 | 2 |
| 16 — 15 | 1 |
| 15 — 14 | 1 |
| | Total 47 |

Although these figures are lower than anticipated, the average figure is approximately 2 per cent. higher than that found at Serdang, while there are also 6 plants in which the ether extract of the roots lies between 25 and 27 per cent. compared with 1 plant from the batch at Serdang.

As a final selection, the first 20 plants in order of merit of ether extract were taken, the figures ranging from 26.83 to 21.83 per cent., the latter figure being over 1 per cent. higher than the minimum figure for the selected Serdang material.

(b) *Derris elliptica*, Sarawak creeping.

Thirty-six plants, aged between 24 and 25 months, were selected at random at Serdang. The same procedure as that outlined for *D. malaccensis* var. *sarawakensis* was followed as regards separation of roots and their analysis.

The weights of marketable roots, calculated on a moisture-free basis, varied from 8.89 to 0.58 ozs. with an average of 3.69 ozs.

The figures for ether extract calculated on a similar basis, varied from 29.65 to 5.08 per cent. with an average of 24.71 per cent.

The average figure for ether extract is remarkably high and compares favourably in this respect with that for high-quality *D. elliptica* root from Singapore.

Table IV, in which the results for ether extract determinations are divided into groups of 1 per cent. indicates the comparatively narrow range over which the figures varied.

## Table IV.

### Species - *Derris elliptica*, Sarawak creeping.

### Ether Extract of Marketable Roots from Individual Plants at Serdang arranged in Groups of 1 per cent.

| Ether Extract (moisture-free basis) | No. of Samples |
|---|---|
| per cent. | |
| 30 — 29 | 4 |
| 29 — 28 | 2 |
| 28 — 27 | 5 |
| 27 — 26 | 4 |
| 26 — 25 | 4 |
| 25 — 24 | 6 |
| 24 — 23 | 3 |
| 23 — 22 | 3 |
| 22 — 21 | 2 |
| Below 21 | 3 |
| | Total 36 |

Compared therefore with *D. malaccensis* var. *sarawakensis* the figures indicate a much higher ether extract, while the proportion of rotenone to ether extract is also higher. Eight samples of root were selected at random for rotenone determinations with the results shown in Table V.

## Table V.

### Relationship between Rotenone Content and Ether Extract for Root of *Derris elliptica*, Sarawak creeping.

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| 3 | 6.74 | 27.47 | 24.5 |
| 9 | 7.42 | 29.65 | 25.0 |
| 13 | 7.61 | 26.59 | 28.6 |
| 16 | 5.55 | 25.90 | 21.4 |
| 19 | 6.24 | 27.04 | 23.1 |
| 22 | 5.76 | 24.32 | 23.7 |
| 30 | 5.92 | 22.64 | 26.1 |
| 34 | 6.13 | 24.13 | 25.4 |
| | | | Average 24.7 |

The results show that the proportions of rotenone to ether extract vary from 21.4 to 28.6 per cent. with an average of 24.7 per cent.

In the case of this species also, 20 plants, based on the amount of ether extract, were selected for propagating purposes, the figures ranging from 29.65 to 24.99 per cent.

(c) *Derris elliptica* (Serdang type).

Although recent work has shown that samples of mixed root from this species of Derris are poor both in rotenone and ether extract (3), the investigation was extended to include a small number of individual plants for the purpose of obtaining the range of variation for this type.

Twelve plants, aged between 24 and 25 months, were selected at random from a plot at Serdang and the same procedure as already outlined for other species followed as regards separation of roots and their analysis.

The weights of marketable roots, calculated on a moisture-free basis, varied from 9.41 to 2.24 ozs. with an average of 5.83 ozs.

The figures for ether extract, calculated on a similar basis, varied from 9.92 to 1.75 per cent. with an average of 6.92 per cent. Table VI, in which the figures are divided into groups of 1 per cent., indicates the frequency of variation.

## Table VI.

### Species - *Derris elliptica* (Serdang type)

### Ether Extract of Marketable Roots from Individual Plants at Serdang arranged in Groups of 1 per cent.

| Ether Extract (moisture-free basis) | No. of Samples |
|---|---|
| per cent. | |
| 10 — 9 | 1 |
| 9 — 8 | 2 |
| 8 — 7 | 3 |
| 7 — 6 | 4 |
| 6 — 5 | 1 |
| Below 5 | 1 |
| | Total 12 |

Estimations of rotenone were carried out on two samples, the results being as shown in Table VII. The figures indicate that the proportion of rotenone to ether extract is approximately 19.5 per cent. for this species.

## Table VII.

### Relationship between Rotenone Content and Ether Extract for Roots of *Derris elliptica* (Serdang type)

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| 1 | 1.25 | 6.30 | 19.8 |
| 12 | 1.91 | 9.92 | 19.1 |
| | | | Average 19.5 |

While the weights of marketable roots per plant are greater than those for the first two species, the low range of figures for both rotenone and ether extract precludes this type from being considered as a commercial proposition. No plants were therefore selected for propagating purposes.

(d) *Derris polyantha*?

Twelve plants of this species, aged between 24 and 25 months, were selected at random at Serdang and the same procedure followed as regards the separation of roots and their analysis.

A feature of this species was the wide variation in the weights of marketable roots from individual plants, also the nature of the root. In most cases the root system consisted of long and very gradually tapering individual roots. In one instance the length of such a root exceeded 25 feet. Such roots would be expensive to harvest especially in a soil of compact nature.

The weights of marketable roots, calculated on a moisture-free basis, varied from 21.25 to 2.79 ozs. with an average of 8.17 ozs.

The figures for ether extract, calculated on a similar basis, varied from 17.02 to 9.49 per cent. with an average of 11.82 per cent.

Table VIII, in which the figures are divided into groups of 1 per cent., indicates the frequency of variation.

## Table VIII.

### Relationship between Rotenone Content and Ether Extract for Roots of *Derris polyantha?*

| Ether Extract (moisture-free basis) | No. of Samples |
|---|---|
| per cent. | |
| 18 — 17 | 1 |
| 17 — 16 | — |
| 16 — 15 | — |
| 15 — 14 | — |
| 14 — 13 | 2 |
| 13 — 12 | — |
| 12 — 11 | 4 |
| 11 — 10 | 3 |
| 10 — 9 | 2 |
| | Total 12 |

Estimations of rotenone were made on two samples, the results being given in Table IX. The figures indicate that the proportion of rotenone to ether extract for this species is approximately 24.3 per cent.

No plants were selected for propagating purposes. Although the average weight of marketable roots per plant is considerably higher than that found for any of the other species examined, the comparatively low figures for both rotenone and ether extract, which are below the present market requirements, preclude this species also from being recommended for planting on a large scale.

## Table IX.

### Relationship between Rotenone Content and Ether Extract for Roots of *Derris polyantha?*

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| 2 | 4.29 | 17.02 | 25.2 |
| 7 | 2.53 | 10.84 | 23.3 |
| | | | Average 24.3 |

(e) *Derris elliptica* (Singapore type).

Planting material and roots from this species, which is cultivated on a large scale in the Changi area, Singapore, were selected. Compared with the usual estate practice a different procedure is followed at Changi as regards cultivation of the plants and harvesting of the roots. A brief description of the methods used is given.

Once the cutting has become established and lateral branches have developed, a short length of each branch is buried or layered to encourage root formation, this process being repeated as the plant develops. Heavy manuring is practised.

Harvesting commences usually when the plants are about 18 months old. The main or anchor root thrown out by the original cuttings is not disturbed, only those roots from the procumbent stems being removed. The roots are carefully severed from the stems, which are raised or bent back while the roots are lifted. When this operation is completed, the procumbent stems are restored to the original positions on the ground, being layered down later, and portions of them covered with soil to induce fresh root development.

Using this method of cultivation and a regular system of heavy manuring, the plants can be maintained on the land for a number of years, the roots being harvested annually.

The soil is very loose and friable and has the appearance of being almost a pure coarse sand. Soil conditions appear to stimulate root development and to facilitate harvesting.

Cuttings and roots from 21 individual plants, which were being harvested for the first time, were collected. The plants were selected at random and included representatives of two races of this species, namely Changi 1 and Changi 2, as described by Henderson (4).

The weights of marketable roots, calculated on a moisture-free basis, varied from 11.85 to 3.18 ozs. with an average of 7.80 ozs.

Determinations of both ether extract and rotenone were made in all cases, since previous work had shown that mixed roots from this species were characterized by a high ether extract combined with a high rotenone content.

The results of analysis are shown in Table X, the figures being grouped as far as possible according to the races to which the individual plants belonged.

The figures indicate wide variations in respect of both ether extract and rotenone for individual plants.

The figures for ether extract vary from 25.10 to 11.14 per cent. with an average of 20.52 per cent.; those for rotenone from 7.16 to 2.30 per cent. with an average of 5.28 per cent.

There are also wide variations in the proportion of rotenone to ether extract, the figures ranging from 31.6 to 16.7 per cent. with an average of 25.5 per cent.

The figures also show similar ranges of variation in all respects for roots from both races of this species.

## Table X.

### Relationship between Rotenone Content and Ether Extract for Roots of *Derris elliptica* (Singapore type) from Changi.

### First Series.

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| Changi No. 1 | | | |
| 2 | 5.44 | 23.68 | 23.0 |
| 3 | 7.13 | 24.62 | 29.0 |
| 6* | 2.72 | 16.28 | 16.7 |
| 9 | 3.70 | 14.61 | 25.3 |
| 10 | 3.27 | 13.66 | 23.9 |
| 14 | 6.64 | 23.42 | 28.3 |
| 15 | 6.95 | 22.07 | 31.5 |
| 16 | 6.20 | 25.10 | 24.7 |
| 17* | 5.92 | 22.73 | 26.0 |
| 18 | 6.32 | 23.50 | 26.9 |
| 19 | 6.01 | 24.74 | 24.3 |
| Changi No. 2 | | | |
| 1 | 2.30 | 11.14 | 20.6 |
| 4 | 5.94 | 22.03 | 27.0 |
| 5* | 4.30 | 13.29 | 32.4 |
| 7 | 4.85 | 20.40 | 23.8 |
| 8 | 6.00 | 22.28 | 26.9 |
| 20 | 4.89 | 22.74 | 21.5 |
| 21 | 2.46 | 14.05 | 17.5 |
| 22 | 5.71 | 24.00 | 24.8 |
| 23 | 7.16 | 22.67 | 31.6 |
| 24 | 7.09 | 23.98 | 29.4 |
| Average (for all plants) | 5.28 | 20.52 | 25.5 |

*Note*:—Doubtful identifications are indicated by an asterisk.

Final selection of planting material for propagating purposes was made from cuttings from the first 13 plants in order of merit of ether extract. The figures ranged from 25.10 to 22.03 per cent., the minimum figure being between 1 and 2 per cent. higher than the average for the whole series. The rotenone content of the selected samples varied from 7.16 to 5.44 per cent.

Compared with the results of analysis for previous samples of mixed root from this source, the average figures for both ether extract and rotenone were considered low, the usual range being of the order

| | per cent. |
|---|---|
| Ether extract ... ... | 24 to 26 |
| Rotenone ... ... | 8 to 9 |

Since the plants were only 18 months old, and in addition successive layerings would have resulted in the development of a varying proportion of young roots which would be low in toxic content, material from older plants was obtained. These plants were stated to be 40 months old and to have been harvested only once previously when 24 months old. Cuttings and roots from 20 plants were taken.

The weights of marketable roots, calculated on a moisture-free basis, varied from 27.94 to 8.51 ozs. with an average of 15.46 ozs. These figures showed marked increases over those for the first series.

The results of analysis of the individual samples are shown in Table XI.

## Table XI.

**Relationship between Rotenone Content and Ether Extract for Roots of *Derris elliptica* (Singapore type) from Changi.**

**Second Series.**

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| 25 | 6.01 | 22.85 | 26.3 |
| 26 | 6.38 | 25.59 | 24.9 |
| 27 | 5.71 | 18.88 | 30.3 |
| 28 | 8.30 | 27.05 | 30.7 |
| 29 | 5.41 | 22.36 | 24.2 |
| 30 | 5.15 | 19.86 | 25.9 |
| 31 | 5.17 | 18.82 | 27.5 |
| 32 | 6.07 | 25.50 | 23.8 |
| 33 | 7.81 | 23.73 | 32.9 |
| 34 | 6.27 | 23.40 | 26.8 |
| 35 | 6.29 | 28.00 | 22.5 |
| 36 | 4.85 | 19.60 | 24.7 |
| 37 | 9.17 | 27.91 | 32.9 |
| 38 | 5.73 | 21.97 | 26.1 |
| 39 | 6.18 | 24.52 | 25.2 |
| 40 | 7.29 | 27.49 | 26.5 |
| 41 | 5.90 | 25.45 | 23.2 |
| 42 | 6.19 | 23.82 | 26.0 |
| 43 | 7.33 | 25.80 | 28.4 |
| 44 | 7.49 | 25.26 | 29.6 |
| Average | 6.44 | 23.89 | 26.9 |

It will be seen that the figures for ether extract vary from 28.00 to 18.82 per cent. with an average of 23.89 per cent.; those for rotenone from 9.17 to 4.85 per cent. with an average of 6.44 per cent.

The proportion of rotenone to ether extract varies from 32.9 to 22.5 per cent. with an average of 26.9 per cent.

Although there are still wide variations in respect of ether extract, rotenone content and proportion of rotenone to ether extract for roots from individual plants, the range in every case is slightly higher than in the first series as the figures in Table XII show.

## Table XII.

### Comparison of Toxic Contents between two Series of Samples of *Derris elliptica* (Singapore type) from Changi.

(Moisture-free Basis)

| | First Series | Second Series |
|---|---|---|
| | per cent. | per cent. |
| Ether Extract | | |
| Maximum ... ... ... | 25.10 | 28.00 |
| Minimum ... ... ... | 11.14 | 18.82 |
| Average ... ... ... | 20.52 | 23.89 |
| Rotenone | | |
| Maximum ... ... ... | 7.16 | 9.17 |
| Minimum ... ... ... | 2.30 | 4.85 |
| Average ... ... ... | 5.28 | 6.44 |
| Proportion of Rotenone to Ether Extract | | |
| Maximum ... ... ... | 31.6 | 32.9 |
| Minimum ... ... ... | 16.7 | 22.5 |
| Average ... ... ... | 25.5 | 26.9 |

While the average figures for ether extract and rotenone are still lower than those found for previous samples of mixed root, enquiries made in Singapore showed that the small bundles of Changi root offered for sale are composed of selected individual roots, the long and slightly tapering fleshy roots being frequently sorted out by the growers and reserved for sale in the local market. It would therefore appear reasonable to assume that the toxic content of such roots may be above the average. In any case such roots cannot be considered as typical of the product as exported.

Cuttings from the first 17 plants in order of merit of ether extract were taken for propagating purposes, making 30 plants in all for the two series.

The ether extract of the roots of cuttings from the second series ranged from 28.00 to 19.86 per cent., the rotenone content from 9.17 to 5.15 per cent.

In addition to the samples from Changi the root systems of 7 plants of this species, approximately 36 months old, and growing in the Experimental Plantation, Kuala Lumpur, were also analysed. Two plants were selected for propagating purposes, the root systems of both plants being high in both ether extract and rotenone as the figures in Table XIII show.

## Table XIII.

### Relationship between Rotenone Content and Ether Extract for Root of *Derris elliptica* (Singapore type) from Kuala Lumpur.

| Serial No. of Plant | Rotenone (moisture-free basis) | Ether Extract (moisture-free basis) | Proportion of Rotenone to Ether Extract |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| 2 | 8.99 | 26.92 | 33.4 |
| 5 | 9.29 | 25.47 | 36.4 |
| | | | Average 34.9 |

(f) *Derris malaccensis* (Kinta type).

A series of samples of the above species which is characterized by a moderately high ether extract but only a very small proportion of rotenone, has been obtained from the Kinta District in Perak.

The crop is grown largely on old mining land, the soil resembling to a certain extent the sandy soil at Changi.

Twenty-two plants were selected at random on a holding near Malim Nawar. The plants were stated to be approximately 25 months old and were about to be harvested.

The yields of marketable roots, calculated on a moisture-free basis, varied from 8.28 to 1.13 ozs. with an average of 2.99 ozs.

The figures for ether extract, calculated on a similar basis, varied from 22.07 to 14.41 per cent. with an average of 18.79 per cent.

Table XIV, in which the figures for ether extract are arranged in groups of 1 per cent., indicates the frequency of variation.

The rotenone content varied from 0.61 per cent. to nil, so that from the point of view of commercial valuation this species may be regarded as rotenone-free.

Based on an ether extract figure of 20 per cent. on a moisture-free basis, which corresponds to 18 per cent. on an air-dry (10 per cent. moisture) basis,

## Table XIV.

### Species - *Derris malaccensis* (Kinta type.)

### Ether Extract of Root Systems from Individual Plants at Malim Nawar arranged in Groups of 1 per cent.

| Ether Extract (moisture-free basis) | No. of Samples |
|---|---|
| per cent. | |
| 23 — 22 | 1 |
| 22 — 21 | 2 |
| 21 — 20 | 5 |
| 20 — 19 | 2 |
| 19 — 18 | 5 |
| 18 — 17 | 3 |
| 17 — 16 | 1 |
| 16 — 15 | 1 |
| 15 — 14 | 2 |
| | Total 22 |

the results indicate that there are only 8 plants in which the ether extract of the root system is in excess of the standard. In making the selection for propagating purposes, two additional samples in which the ether extract figures were between 20 and 19 per cent. were, however, included, since in both cases the figure for the ether extract was less than 0.5 per cent. below the standard.

### Summary of Results of Investigation.

A summary of the results of the investigation giving particulars of the numbers of plants selected in each species, together with the limits of variation for ether extract and rotenone, is given in Table XV.

It must be pointed out that the figures for ether extract and rotenone of the different species are not strictly comparable. There are differences in age of plants, nature of cultivation, method of harvesting, any of which may exert an influence on the toxic content of the roots. For example, the results of analysis of roots from plants cultivated according to the Changi system, which is essentially a method to encourage a prolific root formation, are not comparable with those for plants of the same species which have developed naturally and in which at the time of harvesting the whole of the root system is lifted.

It is claimed, however, that the maximum figures do give an indication of the standards of the toxic contents of the roots which may at least be reached in the different species if the plants remain true to type, are not affected by change in environment, and are harvested at the optimum period.

## Table XV.

### Limits of Toxic Contents of Root Systems of Derris Plants Selected for Trial.

| Species of Derris | Location | No. of Plants Selected | Ether Extract (moisture-free basis) | | Rotenone (moisture-free basis) | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Maximum | Minimum | Maximum | Minimum | |
| | | | per cent. | per cent. | per cent. | per cent. | |
| *D. elliptica* (Singapore type) | Changi | 13 | 25.10 | 22.03 | 7.13 | 5.44 | |
| — do. — | - do. - | 17 | 28.00 | 19.86 | 9.17 | 5.15 | |
| — do. — | Kuala Lumpur | 2 | 26.92 | 25.47 | 9.29 | 8.99 | |
| *D. elliptica,* Sarawak creeping | Serdang | 20 | 29.65 | 24.99 | 7.30 | 6.20 | The figures for rotenone content are onlv approximate and are calculated values based on a proportion of 24.7 per cent. as found for certain plants. |
| *D. malaccensis* var. *sarawakensis* ... | Serdang | 20 | 25.65 | 20.66 | 3.80 | 3.00 | The figures for rotenone content are only approximate and are calculated values based on a proportion of 24.7 per cent. as found for certain plants. |
| — do. — | Kuala Lumpur | 20 | 26.83 | 21.83 | 3.90 | 3.20 | |
| *D. malaccensis* (Kinta type) | Malim Nawar | 10 | 22.07 | 19.57 | 0.33 | Nil | |

### Outline of Further Work.

The clones have all been planted at Serdang. Two different types of soil have been chosen for the experiment. The first belongs to the valley quartzite type and the soil may be described as consisting of a dark clay loam with 50 to 60 per cent. of the fine fractions; the second belongs to the Raub type and consists of a yellow friable soil with a good crumb structure.

The plants have been set in rows 8 feet apart with 5 feet between plants in the rows, thus ensuring ample space for root development.

### Acknowledgments.

In conclusion the writers wish to acknowledge the assistance of Mr. J. N. Milsum, Acting Agriculturist, Mr. J. L. Greig, Assistant Agriculturist, Mr. C. L. Newman, Agricultural Officer, Singapore, and Mr. C. W. S. Hartley, Agricultural Officer, Lower Perak, in the conduct of this investigation.

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(4) Henderson, M. R. The Sources of "Tuba" in the Malay Peninsula. *Malayan Agricultural Journal,* Vol. XXII, No. 3, March, 1934, page 125.

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# DERRIS CULTIVATION IN PERAK

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During recent years the cultivation of Derris has spread considerably in the Kinta and Batang Padang Districts of Perak. At the present time, it is estimated that there are some 900 acres under cultivation and the area is increasing. Planting is mainly undertaken on land, held on temporary occupation license by Chinese, surrounding the tin mines in the Kinta valley. It is stated that Derris has been grown for the past fifteen years at Malim Nawar which appears to be the centre of the industry.

## Species.

Examination of flowering material and the growing plant in the field inclines the writer to identify the species cultivated as *Derris malaccensis* Prain. This determination is based on the description of the species given by King in *Materials for a Flora of the Malayan Peninsula* (1) and Ridley in *Flora of the Malay Peninsula* (2). King cites two varieties after the description of *D. malaccensis,* based on fruiting specimens alone. It will be necessary for a revision of this group to be made before it may be stated with certainty whether more than one plant is included under this species, as inferred by King. The Kinta plant differs from *D. malaccensis* var. *sarawakensis* Henderson (3) in habit, having much shorter branches, and a more sprawling growth. Further, the branches do not grow erect from the rootstock but bend over and assume a semi-horizontal position, giving the plant a very different appearance from var. *sarawakensis.* It is proposed to refer to the plant grown at Kinta and described here, as *Derris malaccensis,* Kinta type. As regards the toxic content of this Derris, results of analysis conducted by the Chemical Division show that the root is characterized by a very low rotenone content combined with a moderately high ether extract, as indicated by the following figures from material collected from plants nearly two years old.

*Derris malaccensis,* Kinta type.

| | Moisture-free-basis per cent. |
|---|---|
| Ether extract ... ... | 19.2 |
| Rotenone ... ... | 0.2 |

The plant referred to locally as "tuba merah" fits in the *Derris malaccensis* group, and preliminary analysis shows that the toxicity of the root is of the same order as that of the Kinta plant.

So far as can be ascertained there is only the one species of Derris cultivated in the Kinta District and it is popularly believed that other kinds will not thrive. There is no evidence available in support of this belief, which is probably

erroneous, since in the Changi district of Singapore, *D. elliptica* is grown on sandy soil with conspicuous success. The growth of this crop on the poor soil and tailings in the Kinta District is remarkable, and the plant is evidently well suited to the conditions obtaining.

### Cultivation.

In the majority of instances the land planted with Derris surrounds the *atap*-roofed houses built by the occupants. Derris is now the major crop in the mining areas and is considered more remunerative than other forms of temporary cultivation, *e.g.*, tapioca and vegetables. Many of the Chinese growers work or have dependants working on the adjoining tin mines. When preparing the land for planting, all heavy growth is burned off, but weeds and *lalang* grass, *Imperata arundinaceae,* are turned into the soil in order to provide organic matter. The soil is cultivated to a depth of eighteen inches and prepared in as friable a condition as possible for planting.

Cuttings of one foot or less in length are selected from mature plants. These are planted, usually in full sunlight, at an angle and close together, in sandy soil. A site is selected near wells or streams, to facilitate watering. The cuttings root rapidly and are ready for transplanting within twenty to thirty days. The planting distance varies but is usually about $2\frac{1}{2}$ feet by $2\frac{1}{2}$ feet or 3 feet by 3 feet, square planting, and generally two cuttings are planted in each hole. Planting is done during rainy weather. On good soil, frequently no manuring is carried out, but on land previously under cultivation, liquid manure from various sources is applied several times weekly. This continues until the plants are about three weeks old. Where pigs are not kept, cattle manure is purchased from Bengalis for use as liquid manure. Regular weeding is done until the land is well covered with growth, *i.e.* about one year from planting. No pests are reported as causing damage to the crop.

### Harvesting.

The time of harvesting varies and is governed to some extent by necessity or the advent of Chinese festivals. The period between planting and harvesting may be two to four years, but usually is about two years. The roots are lifted by means of the changkol or by hand, the sandy soil making this operation an easy one. All the stems are cut and removed in order to leave the land clear for harvesting. The sandy soil renders harvesting less laborious than on heavier soils.

The roots are lifted and cleaned, but not washed, and roughly bundled before being transported to the local buyer. The root is commonly delivered to the buyer in small quantities, frequently by bicycle transport. Harvesting is usually done at intervals so that an advance on the crop may be obtained and the root be disposed of as soon as lifted. Information is available only as to the wet root harvested, as the growers do not dry the root before sale.

## Yields.

Yields are stated to range from 14 cwt. to 2 tons per acre depending upon the state of the land. These figures must be accepted with reserve, since it is doubtful whether actual crop records have been taken. The loss of weight on drying is approximately 60 per cent. Twenty plants selected at random, from an area stated to be nearly two years old, yielded an average of 3¼ ozs. of air-dry root (10 per cent. moisture) per plant, which at 6,000 plants per acre approximates to a yield of 11 cwt. of dried root per acre. In this instance, the yield of root appeared to be low, probably on account of immaturity, but estimation of yield is a matter of difficulty since no accurate information of the number of plants to the acre is available. A second crop is commonly planted which is stated to yield 24 to 36 cwt. of wet root per acre. Subsequently, or when the land is considered worn out, it is allowed to revert to *lalang* grass or secondary growth. This procedure undoubtedly rejuvenates the land, but the biological processes involved are as yet incompletely understood. There is no suggestion of specific action by *lalang* or any other plant.

## Marketing.

There are several Chinese dealers in the district who purchase the fresh root. The dealers dry, bale, and pack the root for export. One large dealer at Malim Nawar has a drying ground, store and baling press, and deals with about 7 tons of root a month. The dried root is pressed into bales weighing 2 cwt.; these are covered with sacking before despatch. Present prices (May, 1936), are $13.50 to $15 per picul (133 1/3 lbs.) for the fresh root and $37 per picul for the dried root, the latter price being obtained by the dealers upon delivery.

## Acknowledgments.

The writer wishes to acknowledge assistance in the preparation of these notes, from Major C. D. V. Georgi, Agricultural Chemist. He is also indebted to Mr. C. W. S. Hartley, Agricultural Officer, Perak South, and Mr. Ng Cheng Chong, Chinese Sub-Inspector of Agriculture, for assistance in collecting information in the field.

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# CHEMICAL COMPOSITION OF CARPET GRASS FROM SERDANG

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## Introductory.

Experiments have been carried out recently to determine the variation in composition of carpet grass (*Axonopus compressus*) when cut at different intervals, since it has been found that cattle do not relish this grass.

Further, since it was also reported that the grass appeared to have a purging effect on some animals, determinations of the hydrocyanic acid content of the grass were made.

A small experimental plot of the grass at the Central Experiment Station, Serdang, was used as a source of supply of material. Three strips were marked off in the plot and the grass in the three strips cut with a scythe. The strips were then cut at intervals of four weeks, five weeks and six weeks respectively. The experiment was continued for a period of four months. Dry weather prevailed during the latter part of the experiment. The grass was sampled immediately after cutting and despatched to the laboratory for analysis.

The analysis of the grass comprised determinations of moisture, crude protein, crude fat, crude fibre, ash, lime and phosphoric acid.

The results of analysis are shown in Table I and II. Average figures for the moisture, crude protein and crude fibre contents of guinea grass (*Panicum maximum*) from the control plots of the manurial experiments now being carried out with this grass at the Central Experiment Station, Serdang, are added for purposes of comparison.

**Table I.**

**Moisture Content of Carpet Grass and Guinea Grass at Varying Intervals of Cutting.**

| Details | Maximum | Minimum | Average |
|---|---|---|---|
| | per cent. | per cent. | per cent. |
| *Four-Weekly Cutting.*— | | | |
| Carpet grass ... | 75.6 | 65.2 | 71.1 |
| Guinea grass ... | 78.4 | 73.7 | 76.3 |
| *Five-Weekly Cutting.*— | | | |
| Carpet grass ... | 72.7 | 63.3 | 69.3 |
| Guinea grass ... | 76.5 | 73.7 | 74.9 |
| *Six-Weekly Cutting.*— | | | |
| Carpet grass ... | 75.6 | 64.3 | 69.3 |
| Guinea grass ... | 77.4 | 70.9 | 74.9 |

## Table II.

### Results of Analysis of Carpet Grass at Varying Intervals of Cutting.

(Moisture-free Basis.)

| Details of Grass | Crude Protein | Crude Fat | Nitrogen-free Extract (by difference) | Crude Fibre | Ash | Lime | Phosphoric Acid |
|---|---|---|---|---|---|---|---|
| | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| *Four-Weekly Cutting.—* | | | | | | | |
| Carpet grass ... ... | 8.3 | 1.7 | 53.5 | 30.5 | 6.0 | 0.49 | 0.47 |
| Guinea grass ... ... | 12.3 | | | 30.0 | | | |
| *Five-Weekly Cutting.—* | | | | | | | |
| Carpet grass ... ... | 7.5 | 1.4 | 54.4 | 30.8 | 5.9 | 0.55 | 0.46 |
| Guinea grass ... ... | 10.8 | | | 29.9 | | | |
| *Six-Weekly Cutting.—* | | | | | | | |
| Carpet grass ... ... | 7.5 | 1.4 | 54.5 | 30.8 | 5.8 | 0.50 | 0.42 |
| Guinea grass ... ... | 10.1 | | | 29.9 | | | |

### Observations on Results of Analysis.

The results of analysis indicate that the moisture content of carpet grass is liable to a greater variation than that of guinea grass, especially during spells of dry weather.

It is probable that the lower moisture content may render the grass less succulent and therefore less palatable.

The figures (Table II) also show that the crude protein content of carpet grass is less than that of guinea grass. Further, as would be expected, there is a reduction in the crude protein content with an increase in the age of the grass. The reduction is, however, less marked with carpet grass than with guinea grass.

The crude fibre contents of both grasses are of the same order.

### Hydrocyanic Acid Content of Grass.

The average results of the determinations of the hydrocyanic acid content of the grass compared with guinea grass cut at the same intervals of cutting are given in Table III.

### Table III.

### Hydrocyanic Acid Content of Carpet Grass and Guinea Grass at Varying Intervals of Cutting.

| Details | Hydrocyanic Acid |
|---|---|
| | per cent. |
| *Four-Weekly Cutting.*— | |
| Carpet grass ... ... ... | .0013 |
| Guinea grass ... ... ... | .0014 |
| *Five-Weekly Cutting.*— | |
| Carpet grass ... ... ... | .0013 |
| Guinea grass ... ... ... | .0009 |
| *Six-Weekly Cutting.*— | |
| Carpet grass ... ... ... | .0010 |
| Guinea grass ... ... ... | .0009 |

The figures indicate that the hydrocyanic acid content of both grasses is of the same order, the slightly higher figures for carpet grass in two cases being due to the lower moisture content.

## General.

The results of the investigation show, therefore, that carpet grass has a lower crude protein content than guinea grass. Further, during dry weather the grass may be less palatable than guinea grass owing to a lower moisture content.

In conclusion the writer wishes to thank Mr. J. Lambourne, Assistant Agriculturist, for arranging the collection of the samples at Serdang, and Inche Othman bin Mohamed Lela for the analytical work.

*Received for publication 11th May 1936.*

# CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

**2nd Quarter, 1936.**

*Prepared by the Economics Branch of the Department of Agriculture, Straits Settlements and Federated Malay States, in collaboration with the Field Branch of the Department.*

## Rainfall.

June was an exceptionally dry month throughout the Peninsula. April was abnormally dry in most districts and May was wet. Heavy rains were experienced during April in some areas, notably parts of Johore, Perak North and Province Wellesley.

## Prices.

Prices remained at the higher level reached in the last month of the first quarter, although there was a slight weakening in May and June in sympathy with the market. Scrap continued to fetch the higher price mentioned in this report for the first quarter.

Table I shews the lowest and highest prices paid for small-holders' rubber at several centres in each State and Settlement, and Table II gives the mean of the range.

## Production.

Table III summarizes production of rubber on small holdings during the second quarter. This table is compiled from the monthly report of production, stocks, imports and exports of rubber published by the Registrar-General of Statistics, S.S. and F.M.S.

## Tapping.

The results of the quarterly survey of small holdings out of tapping are given in Table IV. The estimates are obtained by counting the number of holdings out of tapping, and applying the percentage to the total area of small holdings in the District.

The table shews that, with the exception of the Federated Malay States, there was a slight decrease in the holdings out of tapping. At the end of June, 1936, the following acreages were estimated to be out of tapping:—Federated Malay States 219,328 (40 per cent.), Straits Settlements 35,595 (29 per cent.), Johore 103,112 (32 per cent.), Kedah 42,300 (42 per cent.). The relative figures at the end of the first quarter (March) were as follows:—219,300 (41 per cent.), 39,400 (33.8 per cent.), 138,600 (43 per cent.), 50,900 (50.5 per cent.).

The acreages estimated to be out of tapping at the end of June 1935 were as follows:—Federated Malay States 144,500 (27 per cent.), Straits Settlements 22,000 (18.9 per cent.).

## Table I.

### Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

### (In Straits dollars per picul (133 1/3 lbs.) )

### 2nd Quarter 1936.

| | Penang | Perak | Selangor | Negri Sembilan | Pahang | Malacca | Kedah | Johore |
|---|---|---|---|---|---|---|---|---|
| | | | **APRIL** | | | | | |
| Smoked sheet | 32.50-35.50 | 29.38-34.50 | 28.00-34.50 | 31.00-34.20 | 30.95-35.60 | 33.50-34.50 | 31.00-34.40 | 32.00-34.80 |
| Unsmoked sheet | 31.00-35.00 | 27.00-33.80 | 26.00-33.00 | 29.00-33.00 | 29.25-33.00 | 31.50-33.50 | 30.00-33.20 | 30.00-34.00 |
| Scrap | 25.00-29.00 | — | 24.00-29.50 | 26.00-30.00 | — | 28.00-30.50 | 27.00-30.50 | 28.00-30.00 |
| | | | **MAY** | | | | | |
| Smoked sheet | 31.50-34.00 | 31.00-34.50 | 27.50-34.95 | 30.50-33.80 | 29.00-34.60 | 32.00-33.50 | 32.00-35.00 | 31.00-33.60 |
| Unsmoked sheet | 30.00-33.80 | 27.00-33.70 | 29.00-32.00 | 25.00-32.50 | 29.00-33.00 | 30.50-32.50 | 30.00-34.00 | 28.50-33.00 |
| Scrap | 22.50-28.50 | — | 22.00-27.25 | 23.70-29.00 | — | 27.00-29.50 | 27.00-30.00 | 23.00-30.00 |
| | | | **JUNE** | | | | | |
| Smoked sheet | 31.50-33.70 | 30.50-34.00 | 28.00-34.00 | 30.50-32.90 | 28.00-34.00 | 31.50-33.50 | 31.50-33.50 | 29.75-34.00 |
| Unsmoked sheet | 30.50-33.30 | 27.00-32.50 | 29.00-32.00 | 25.00-31.80 | 29.00-32.00 | 30.00-32.50 | 30.00-32.00 | 27.50-33.20 |
| Scrap | 21.00-28.00 | — | 22.00-28.00 | 23.00-29.00 | — | 28.00-29.50 | 27.00-30.00 | 23.50-30.00 |

## Table II.

### Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

### (In Straits dollars per picul (133 1/3 lbs.) )

### 2nd Quarter 1936.

| | Penang | Perak | Selangor | Negri Sembilan | Pahang | Malacca | Kedah | Johore |
|---|---|---|---|---|---|---|---|---|
| | | | APRIL | | | | | |
| Smoked sheet | 33.95-35.00 | 32.22-33.73 | 31.83-33.68 | 31.72-33.64 | 31.24-33.77 | 33.50-34.50 | 32.85-33.98 | 32.84-34.11 |
| Unsmoked sheet | 32.12-33.88 | 30.79-32.79 | 29.25-31.40 | 30.52-32.54 | 30.44-32.25 | 31.83-33.00 | 31.50-32.92 | 31.74-33.03 |
| Scrap | 26.25-27.50 | — | 26.30-28.85 | 26.83-29.16 | — | 28.83-30.00 | 27.75-30.00 | 28.36-29.46 |
| | | | MAY | | | | | |
| Smoked sheet | 32.38-33.88 | 31.96-33.50 | 30.95-33.32 | 31.22-33.26 | 30.33-32.90 | 32.33-33.00 | 32.92-33.88 | 31.84-32.98 |
| Unsmoked sheet | 30.88-32.58 | 29.80-31.98 | 30.00-31.66 | 29.10-31.90 | 29.62-31.75 | 31.00-32.00 | 31.62-32.50 | 30.27-32.15 |
| Scrap | 25.12-26.38 | — | 24.50-24.87 | 24.56-28.16 | — | 27.83-28.83 | 27.66-29.16 | 26.53-27.72 |
| | | | JUNE | | | | | |
| Smoked sheet | 32.12-33.45 | 31.52-32.87 | 31.47-33.47 | 31.32-32.62 | 30.45-32.73 | 31.83-32.92 | 32.02-33.00 | 31.65-32.76 |
| Unsmoked sheet | 31.25-32.70 | 29.66-31.32 | 30.25-31.38 | 29.35-31.46 | 29.88-31.38 | 30.66-31.92 | 31.05-31.62 | 30.39-31.77 |
| Scrap | 24.50-26.00 | — | 24.50-25.75 | 24.66-28.00 | — | 28.33-29.17 | 27.16-28.66 | 26.76-28.08 |

## Table III.

### Production of Rubber on Small Holdings.

(in tons)

| | Total half-year 1935 | 1st Quarter 1936 | 2nd Quarter 1936 | Total half-year 1936 |
|---|---|---|---|---|
| Federated Malay States ... | 34,110 | 14,796 | 13,108 | 27,904 |
| Unfederated Malay States ... | 29,614 | 11,561 | 13,549 | 25,110 |
| Straits Settlements ... | 6,299 | 2,997 | 3,019 | 6,016 |
| Total ... | 70,023 | 29,354 | 29,676 | 59,030 |

Ignoring Perlis, Kelantan and Trengganu, in which States the area of rubber small holdings is relatively small, the total area out of tapping on small holdings at the end of the second quarter was estimated to be 400,335 acres or 36.8 per cent. as compared with 448,200 acres (41.8 per cent.) at the end of the first quarter.

Most reports suggest that the increase in tapping is due to the improved price obtainable for uncouponed rubber. There is still a considerable trade in coupons and they are usually sold within a few days of issue. A number of small-holders prefer to rest their trees, and, where paid labour is employed, it is often more economic to dispose of coupons.

An experimental additional count of holdings in tapping was made in the middle of the quarter, and, contrary to expectations, this revealed a decrease in holdings in tapping when compared with the usual count at the close of the quarter. The probable explanation is that rubber was required for sale without coupons at the end of the quarter when ready cash was short. One report stated that tapping was in progress at the end of the quarter to accumulate a stock to cover the next wet period.

#### Condition of Holdings.

Improvement in the upkeep of small holdings has been noted as a result of the betterment of economic conditions, and the work of the Asiatic Rubber Instructors is resulting in improved systems of tapping, better sheet manufacture, and the use of proper coagulants.

## Table IV.

**Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of June, 1936.**

| PERAK | | | | SELANGOR | | | | NEGRI SEMBILAN | | | | PAHANG | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| District | Total Tappable area | Total area untapped | Percentage | District | Total Tappable area | Total area untapped | Percentage | District | Total Tappable area | Total area untapped | Percentage | District | Total Tappable area | Total area untapped | Percentage |
| Batang Padang | 33,227 | 6,977 | 21 | Klang | 15,410 | 8,629 | 56 | Seremban | 22,176 | 16,632 | 75 | Raub | 9,342 | 5,411 | 58 |
| Kinta | 36,090 | 6,498 | 18 | Kuala Langat | 23,333 | 8,633 | 37 | Tampin | 16,961 | 12,551 | 74 | Kuala Lipis | 14,588 | 3,209 | 22 |
| Kuala Kangsar | 79,572 | 21,484 | 27 | Ulu Langat | 39,856 | 16,340 | 41 | Kuala Pilah | 26,586 | 7,975 | 30 | Bentong | 11,574 | 3,124 | 27 |
| Upper Perak | 12,680 | 6,974 | 55 | Ulu Selangor | 25,857 | 21,461 | 83 | Jelebu | 8,917 | 3,764 | 31 | Other Districts† | 40,383 | 14,134 | 35 |
| Larut & Selama | 38,210 | 6,113 | 16 | Kuala Lumpur† | 19,327 | 10,436 | 54 | Port Dickson | 11,034 | 5,933 | 51 | | | | |
| Krian | 9,270 | 6,208 | 67 | Kuala Selangor† | 9,512 | 5,136 | 54 | | | | | | | | |
| Lower Perak* | 25,982 | 14,290 | 55 | | | | | | | | | | | | |
| Dindings | 9,273 | 7,418 | 80 | | | | | | | | | | | | |
| | 244,304 | 75,960 | 31 | | 133,295 | 70,635 | 53 | | 86,274 | 46,855 | 57 | | 75,887 | 25,878 | 34 |

| MALACCA | | | | PENANG & P. WELLESLEY | | | | SINGAPORE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| District | Total Tappable area | Total area untapped | Percentage | District | Total Tappable area | Total area untapped | Percentage | District | Total Tappable area | Total area untapped | Percentage |
| Central | 13,109 | 4,325 | 33 | North | 3,941 | 512 | 13 | Singapore | 20,591 | 823 | 4 |
| Alor Gajah | 30,203 | 12,685 | 42 | Central | 9,540 | 4,010 | 42 | | | | |
| Jasin | 22,883 | 6,636 | 29 | South | 7,508 | 5,180 | 69 | | | | |
| | | | | Penang | 15,822 | 1,424 | 9 | | | | |
| | 66,195 | 23,646 | 36 | | 36,820 | 11,126 | 30 | | 20,591 | 823 | 4 |

| | | | |
|---|---|---|---|
| Johore | 322,225 | 103,112 | |
| Kedah | 100,691 | 42,300 | 42 |

The percentage of areas out of tapping in March, 1936, was as follows:—Perak 40, Selangor 34, Negri Sembilan 70, Pahang 29, Malacca 35, Penang and Province Wellesley 36, Singapore 8.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

### Diseases.

Mouldy Rot was considerably in evidence during the quarter when the wet month of May encouraged its incidence; the dry weather of June, however, enabled it to be kept under control. Some cases of *Oidium Heveae* were reported, principally in Perak and Kedah, but the trees affected soon made a natural recovery.

Serious cases of root disease were reported in various districts of Perak, and also in Negri Sembilan; a few cases were reported from Johore.

Sporadic cases of Pink Disease occurred in Pahang, and also in Kedah. Fairly serious soil wash was found on a few holdings in the Kuala Pilah District of Negri Sembilan.

### Grades of Rubber.

There has been an increase in the production of scrap rubber during the quarter. There is still a preference for unsmoked sheet shewn in a large number of districts, due to the slight difference in price obtainable for the smoked grade.

*Kedah.*—There was a reduction in the sales of smoked sheet, this being offset principally by increased production of scrap. The percentages of smoked sheet, unsmoked sheet and scrap respectively were: North Kedah 79, 11, 10; Central Kedah 37, 34, 29; South Kedah 62, 21, 17.

*Perak.*—Increased production of smoked sheet is noteworthy in the reports from this State, and this can doubtless be directly attributed to the adoption of the new smoke-house. In Selama, the sheet sold was, as usual, almost entirely smoked, and in Bagan Serai the percentage of smoked sheet rose slightly, being 35 per cent. to 65 per cent. unsmoked.

In Perak North smoked sheet was sold only at two centres, Taiping and Trong, sales at other centres being of unsmoked sheet. The sales at Taiping are principally from smaller dealers and cannot therefore be taken into account, but the percentage of smoked sheet sold at Trong has increased.

In Perak Central the sales of smoked sheet were larger than those of unsmoked, *e.g.* smoked 55, unsmoked 45. In Perak South also the percentage of smoked sheet has risen: smoked 46, unsmoked 54.

*Selangor.*—There was a marked preference for smoked sheet, and the production of unsmoked sheet was decreasing.

*Penang and Province Wellesley.*—The proportion of unsmoked sheet was less during the quarter under review, being replaced by scrap; percentages were: smoked sheet 10, unsmoked sheet 77, scrap 13.

*Malacca.*—The percentage of smoked sheet increased in Central District, but decreased in Jasin District. Percentages were: Central, smoked 93, unsmoked 4; Alor Gajah, smoked nil, unsmoked 98; Jasin, smoked 26, unsmoked 71.

*Negri Sembilan.*—There was a slight decrease in the proportion of smoked sheet sold during the quarter, the average percentages of the sales of 24 dealers being: smoked 51; unsmoked 49.

### General.

Approximately forty smoke houses have been erected during the quarter under review; these are of the type demonstrated by the Asiatic Rubber Instructors and can be made at a particularly low cost. Continuous efforts are being made to help the small-holder to realize the value of preparing good quality smoked sheet.

In this connexion the experiment in progress in Pahang is of particular interest, and was referred to briefly in this report for the first quarter. Dealers in that State are required to display boards stating the prices paid for the various grades together with samples of the grades; there are six of these, and prices are based either on the standard Kuala Lumpur prices or on the Singapore market. Dealers are asked, however, to make a greater cut in prices for the lower grades than is done in the Kuala Lumpur market, but a premium of 20 to 50 cents per picul is given for No. 1 quality, and of 5 cents for No. 2 quality.

The scheme was introduced at the beginning of this year, and is now working smoothly. The first quarter was principally occupied in ensuring that dealers fully understood instructions and were correctly carrying them out. Attention was then given to instructing small-holders in the use of the boards and samples displayed. This work is naturally slow, but there is no doubt that even after the short period of two or three months, small-holders have been made to realize (1) that there are such things as grades, (2) that their own product is far from first class, and (3) that if they produce a better grade product they will be paid more for it.

There are already a few definite signs that the scheme is working out as expected. All owners of smoke cabinets are now satisfied with the price they obtain for their product and all state that they receive extra money both for smoking and also for the better grade. The rubber dealers' receipt books also indicate that whereas a few months ago all rubber irrespective of quality received one price, now as many as four or five different prices may be paid on any one day.

Several District competitions were held during the quarter in connexion with the All-Malayan Small-Holders' Rubber Competition, and reports indicate that the exhibits received have in some cases reached a particularly high standard.

## Abstract.

# COMBATING THE WARBLE FLY PEST.

A systematic campaign of extracting the grubs and destroying them greatly reduces the average number of grubs per animal in the herd. But the squeezing out of the ripe maggots is a very troublesome and expensive procedure in a large stock farm like the Government Cattle Farm, Hissar.

Numerous experiments and demonstrations on a field scale and particularly in Worcestershire and Gloucestershire, England, have proved that the only method of offering any hope of the ultimate eradication of the warble fly consists in dressing the backs of cattle with a suitable preparation to destroy the larvae and thus prevent their hatching out into flies which would lead to a further infestation. The use of the following larvicides has been reported by different workers:—

1. *Derris Root Powder.*—Extensive work has been carried out during the past four or five years under the auspices of the Leather Sellers' Company's Warble Fly Committee, England. This Committee advocates a remedy consisting of a wash made from powdered derris root, soft soap, and water, and the experiments which have been carried out by this Committee, involving the dressing of scores of thousands of cattle with this preparation, have proved beyond doubt that this is a remedy which is easy of application, effective in its results and practically negligible in its cost. The following preparation is usually used for the dressings:—

| | | | |
|---|---|---|---|
| Derris root powder | ... | ... | 16 oz. |
| Soap | ... | ... | 4 oz. |
| Water | ... | ... | 1 gallon. |

Derris root powder has also been used in other parts of the world in the following forms:—

| | | | | |
|---|---|---|---|---|
| A. | Derris powder | ... | ... | 1 oz. |
| | Water | ... | ... | 1 qrt. |
| B. | Derris powder | ... | ... | 1 part |
| | Petroleum | ... | ... | 20 parts |
| C. | Derris root powder alone dusted in the holes of the warble cells. | | | |

In the case of A and B the preparation is applied to the back of the animals with a stiff brush. Only one or two applications are called for.

2. *Some Other Popular Preparations in Use*—

(a) *Nicotine sulphate* (40 per cent. nicotine):—

| | | | |
|---|---|---|---|
| Nicotine sulphate | ... | ... | 1 fl. oz. |
| Fresh hydrated lime | ... | ... | 1 lb. |
| Water | ... | ... | 1 gallon. |

It is claimed by some workers that this mixture kills 83 to 100 per cent. of the grubs, and that nicotine dust (2 per cent.) dusted into holes kills 100 per cent.

(b) *Pyrethrum ointment*:—

| | | | |
|---|---|---|---|
| Pyrethrum powder | ... | ... | 1 part |
| Petroleum | ... | ... | 2 parts. |

When this ointment is pressed into the warble holes, it gives 100 per cent, results.

(c) *Iodoform ointment*:—

| | | | |
|---|---|---|---|
| Iodoform | ... | ... | 1 part |
| Vaseline | ... | ... | 4 parts. |

As many as five dressings are required before the warbles are cleared out. Its troublesome application and its enormous expense does not justify this treatment.

(d) *Benzole or carbon tetra-chloride* has also been tried but this method of treatment is now discarded for the same reasons.

(e) Kerosene oil, carbolic acid, and gram's solution have also been given a trial. Kerosene oil has been found useless; gram's solution had no effect; and carbolic acid was found very effective for killing the grubs but it severely injured the hides and hair in the region of the warble opening.

(f) In some countries it has also been fully ascertained that with arsenical dips, if systematically employed for the eradication of ticks, the number of warbles is greatly reduced in the following season.

The foregoing is an abstract from "A Review of the Warble Fly Pest in India and Measures for its Control, with Particular Reference to the Government Cattle Farm, Hissar" by B. N. Handa, M.R.C.V.S., Assistant Superintendent (Stock), Government Cattle Farm, Hissar, in *Agriculture and Live-stock in India*, Vol VI, pt. II, 1936.

# Departmental.

## FROM THE DISTRICTS.

*Compiled by the Chief Field Officer from Monthly Reports by Agricultural Officers.*

**July, 1936.**

### The Weather.

The weather was exceptionally dry, even for July, in most parts of the Peninsula and precipitation was below normal at most recording stations. A belt along the coast of Negri Sembilan, Malacca and Johore provides an exception to this generalization, for all records received from coast stations between Port Dickson and Kukup show a precipitation well above normal, the rainfall being so much in excess in certain localities in Johore as to cause flooding of padi areas.

In Kedah, although rainfall approximated to normal, there were occasional heavy showers and high wind, which probably presage an earlier break of the long wet season than occurred last year.

### Remarks on Crops.

*Padi.*—The water supply was a little restricted over parts of Krian towards the end of the month, but, notwithstanding the very dry weather that prevailed generally, no serious damage is reported from anywhere on account of drought.

Planting commenced in North Kedah, whilst in other parts of that State ploughing proceeded satisfactorily under good conditions. Fair progress was made in establishing nurseries in Province Wellesley and conditions are slightly more forward in Penang. In Perak, good progress in clearing the land was made in Krian District, and water supplies were good in the earlier part of the month, but were somewhat reduced at the end of the month, especially in the Selinsing and Semanggol areas. In Larut District generally, water shortage has caused delay in commencing operations. Even in Bukit Gantang, where water has been plentiful as the result of the better irrigation facilities provided last year by the erection of a permanent dam, cultivators have made little attempt to commence operations. Cultivation and the establishment of nurseries of long season strains was in hand in Kuala Kangsar and Upper Perak Districts. Water has been plentiful in Stage I of the Sungei Manik area and many nurseries were established and seedlings have made good growth. Most cultivators in this area have adopted the *rakit* type of nursery and there are indications that this may prove the best type for adoption generally in the area. In Stage II, burning of felled timber was begun on July 15th. A good burn was obtained on a portion of the area where special care had been taken to cut up branches, but was uneven elsewhere. Experience gained this year indicates that, with jungle of this type and under the conditions obtaining, it is unwise to leave the felled trees lying too long before burning is

done. The original intention was to allow the felled timber to remain three months before burning, but it was found that this resulted in a heavy growth of leafy shoots which hampered burning, even though this operation was begun a fortnight earlier than the time originally fixed.

In Selangor, clearing and internal bunding continued at Panchang Bedena and a fairly successful burn was completed on part of this year's new clearing. The burn was less satisfactory on the most recently felled portion of the area and in the Sungei Panjang area. In Negri Sembilan, growth and progress of the crop is reported to be satisfactory, except at Ulu Beranang, where delay was occasioned by water difficulties and in Kuala Pilah District, were operations are late and irregular. In Malacca, plants in the nurseries have made good growth and transplanting was begun in some inland areas. Progress reports from Pahang are also generally satisfactory, though slight water shortage was reported from parts of Raub District. In Kelantan, excessive rainfall has retarded the cultivation of land for dry padi, so that the crop inevitably will be late and prospects are considered to be consequently only fair.

*Rubber.*—There was an increase in the price paid for small-holders' rubber during the month, some sales being recorded at $35 per picul for smoked sheet.

Many reports give brief details indicating that marked improvement has recently taken place in many parts of the country in the preparation of the commodity by small-holders. This has resulted from propaganda by Asiatic Rubber Instructors and Departmental officers and demonstrations of the smoking cabinet at the many Agricultural Shows that were held during the month.

Examination of smoked sheet exhibits at Agricultural Shows indicates that tackiness is a very common fault of small-holders' rubber. This is often the result of the use of an excessive amount of coagulants and of failure to wash adequately after rolling. These items have been noted for correction in areas where the fault has been specially marked at local Shows.

The Agricultural Officer, Johore North Circle, reports that small-holders at Panchor have been induced recently to co-operate in buying formic acid in bulk. This is of special interest, as Panchor was once notorious for the use of large amounts of alum as a coagulant.

Six further cabinets are reported to have been under erection during the month in Batu Pahat District of Johore, three in Negri Sembilan, and two in Batang Padang District of Perak.

Some reports indicate that there is a tendency in certain areas towards a widening margin in the price offered locally for unsmoked and smoked sheet. Should this tendency spread and become a permanent feature, it is bound to result in increasing amounts of smoked sheet being prepared by small-holders. The fact that local quotations for smoked sheet have in the past shown only a small premium over unsmoked sheet is largely because small dealers in country districts have practised no system of grading, their bulked produce having been sold to larger dealers at one price. A general extension to small dealers of the practice of grading is a necessary preliminary to any substantial widening of the

margin of prices offered by them for poor and good quality rubber. The Pahang scheme has resulted in grading being adopted by a number of dealers in that State who had not practised it previously.

*Copra.*—The price of copra further hardened slightly during the month, the Penang quotation for f.m.s. reaching $5.50 per picul towards the end of the month.

Demonstrations of the smoke cabinet for copra were given at a large number of the Shows during the month. Those erected in Johore and elsewhere are working satisfactorily. All the approved kilns erected in the Bagan Datoh area of Perak, both the Ceylon and cabinet types, were employed during the month and turned out estate-quality copra. In the north of Province Wellesley there was a brisk demand for fresh nuts for export as expected and, as the price offered was $22 per 1,000 nuts, they were not available for the local kilns at a paying price. Further smoke cabinets are under erection in the Bagan Datoh area of Perak, in the Kukup District of Johore and in the North and Central Circles of that State.

## Agricultural and Padi Stations and Test Plots.

*Agricultural Stations.*—Reports are mainly concerned with routine maintenance. At a few Stations groundnuts and similar crops were harvested and further satisfactory progress is reported to have been made in stumping and *lalang* grass eradication at the Johore Pineapple Station.

*Padi Stations and Test Plots.*—The preparation of the land and establishment of nurseries took place at the Kedah Station and Plots and at most of the Stations and Plots in Perak. An exception is Bukit Gantang Test Plot, where delay in making a start is occasioned by the reluctance of surrounding cultivators to begin operations. In Negri Sembilan, nurseries were established at Ampang Tinggi Test Plot, and transplanting was in progress at the Kendong Plot and was completed at the Kuala Klawang Plot. At Pulau Gadong Station in Malacca, seasonal operations proceeded satisfactorily with manual labour, but considerable difficulty has been experienced with the mechanical cultivation trials owing to excessive water interfering with drilling operations. In Pahang, sowing was done at Lipis and Dong Plots and transplanting was completed on the Kerdau Plot. In Kelantan, nurseries of wet padi were sown at the Pasir Puteh and Central Stations. At the Central Station the third ploughing for dry padi was delayed on account of rain, but was begun towards the end of the month. At Bachok, the third ploughing was completed satisfactorily. In Johore, some planting was done at Tangkak Plot and further nurseries sown, whilst planting was nearly completed at Jementah Plot.

## Agricultural Shows.

Two State Shows and eighteen District Shows were held during the month in addition to a large number of Mukim Padi and Rubber Competitions organized in connexion with the Thirteenth Malayan Exhibition.

Particulars regarding these Shows will be given in a later issue of this Journal.

# DEPARTMENTAL NOTES.

### Tours of the Adviser on Agriculture.

The Hon'ble the Acting Director of Agriculture, S.S., and Adviser on Agriculture, Malay States, attended the Kuala Langat District Show on 11th July, and on the 18th July the Kuala Selangor District Show at which he judged the padi exhibits. He also attended the Johore State Agricultural Show at Muar on 23rd July, and the District Shows at Seremban, Negri Sembilan, and Kajang, Selangor, on the 25th and 26th July, judging the padi exhibits at both the latter Shows.

### Selangor Pineapple Advisory Committee.

His Highness the Sultan of Selangor has appointed Mr. W. J. B. Johnson of the Department of Agriculture, S.S. and F.M.S., to be a member of the Selangor Pineapple Advisory Committee.

### Tours of the Rural Lecture Caravan.

The Malacca tour of the Rural Lecture Caravan, commenced during June, was completed by a visit to Bukit Tinggih on July 1st and 2nd. This tour was of some three weeks duration (from June 10th to July 2nd inclusive) and eleven centres were visited, at all of which attendences are reported to have been very satisfactory. Except for one night when rain prevented a show being given the weather was favourable.

On July 9th a tour of Negri Sembilan commenced with a visit to Nilai. The tour arranged was also of three weeks duration (July 9th to 28th inclusive) and provided for visits to ten centres including an appearance at three District Shows, namely, at Kuala Klawang on the 11th and 12th, at Rembau on the 17th and 18th, and at Seremban on the 25th and 26th. No detailed report is yet to hand regarding this tour, but a note in the monthly report of the State Agricultural Officer indicates that the tour was carried through in a satisfactory manner.

# Statistical.

## MARKET PRICES.

### July, 1936.

### Major Crops.

*Rubber.*—The market continued its upward tendency and, for the first time, reached 27 cents, the average for the month being 1.10 cents per lb. higher than the previous month. Spot loose opened in Singapore at 26⅜ cents per lb. and rose to 27¼ cents on the 13th July; thereafter the price fluctuated from 26¾ to 27 cents, closing on a falling market at 26⅞ cents per lb.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 26.92 cents per lb. as compared with 25.82 cents in June. The London average price was 7.70 pence per lb., and the New York price 16.4 cents gold, as compared with 7.34 pence and 15.76 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during July are shewn in the following table.

### Table I.

### Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, July, 1936.

(Dollars per Picul.)

| Grades. | Kuala Pilah, Negri Sembilan. | | | | | Kuala Kangsar, Perak. | | | | | Batu Pahat, Johore. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 9 | 16 | 23 | 30 | 1 | 8 | 15 | 22 | 29 | 1 | 8 | 15 | 22 | 29 |
| Smoked sheet | | | | | 34.66 | 33.50 | 34.50 | 34.19 | | | | 34.30 | 34.25 | | |
| Unsmoked sheet | 32.45 | 33.16 | 33.30 | 33.00 | 33.50 | 32.04 | 32.95 | 32.71 | 32.85 | 32.80 | 32.35 | 32.60 | 33.00 | 33.00 | 32.80 |
| Scrap | 28.00 | 29.00 | 29.00 | 28.50 | | | | | | | | 28.00 | 28.20 | | |

Transport by F. M. S. R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent

*Palm Oil.*—Prices improved considerably during July and are given in Table II.

## Table II.

### Prices of Palm Oil and Palm Kernels.

| Date 1936. | Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax. | Palm Kernels, c.i.f. landed weight London/ Continent |
|---|---|---|
| | per ton | per ton |
| July 3 | 16. 8. 9 | 9. 5. 0 |
| ,, 10 | 17. 0. 0 | 10. 0. 0 |
| ,, 17 | 17. 12. 6 | 10. 5. 0 |
| ,, 24 | 18. 5. 0 | 10. 5. 0 |
| ,, 31 | 18. 10. 0 | 10. 7. 6 |

*Copra.*—The market again improved steadily throughout the month, with a slight weakening at the close. The sun-dried grade opened in Singapore at $5.05 per picul and rose to $5.40, falling to $5.15 at the close. The average price for the month was $5.25 per picul as compared with $5.00 in June. There was a wider difference between the grades, the mixed quality averaging $4.82 per picul, as compared with $4.74 in the previous month.

Copra cake rose to $1.75 per picul, the monthly average being $1.62 as compared with $1.46 in June.

*Rice.*—The average wholesale prices of rice per picul in Singapore in June were as follows:—Siam No. 2 (ordinary), $3.75, Rangoon No. 1 $3.50, Saigon No. 1 $3.50, as compared with the May corresponding prices of $3.95, $3.55 and $3.65. The relative prices in June 1935 were: $4.34, $3.80 and $3.87.

The average retail market prices in cents per gantang of No. 2 Siam rice in June were: Singapore 28, Penang 30, Malacca 26, as compared with 28, 28 and 26 respectively in May.

The average declared trade value of imports of rice in June was $3.64, as compared with $3.60 (corrected figure) in May, and $3.66 in April.

*Padi.*—The Government Rice Mill in Perak continued to pay $1.90 per picul for padi, but only a very small quantity was purchased. Retail prices of padi ranged from 6 to 12 cents per gantang.

*Pineapples.*—Packers advanced prices during the month, and average prices per case were: Cubes $3.49, Sliced Flat $3.16, Sliced Tall $3.49, as compared with $3.12, $3.01 and $3.12 respectively in June.

Prices of fresh fruit per 100 were:—Johore 1st quality $2 to $3.20, 2nd quality $1 to $3. 3rd quality 60 cents to $1.80; Selangor $1.20 to $1.40.

## Beverages.

*Tea.*—Nine consignments of Malayan tea were sold on the London market during July; two of upland tea were sold for 1s. 0d. and 1s. 0½d. per lb. and the lowland tea ranged from 11¼d. to 11¾d. per lb.

Average London prices per lb. during July for consignments of tea from other countries were as follows:—Ceylon 1s. 1.04d., Java 10.33d., Indian Northern 1s. 0.15d., Indian Southern 1s. 0.02d., Sumatra 9.94d.

The latest Colombo average prices available are quoted from the *Weekly Tea Market Report,* 28th July, 1936, of the Colombo Brokers' Association, and are as follows (rupee cents per lb.):—High Grown Teas 74 cents, Medium Grown Teas 65 cents, Low Grown Teas 60 cents.

*Coffee.*—The price of Sourabaya coffee in Singapore improved in July averaging $13.16 to $14.35 per picul according to quality, but Palembang coffee was lower, averaging $6.80 to $7.70 per picul as compared with $7.37 to $8.37 in June.

## Spices.

*Arecanuts.*—The following are the averages of the range of prices per picul in Singapore during July: Splits $4.90 to $6.40; Red Whole $4.60 to $6.50; Sliced $9.20 to $10.75.

The Singapore Chamber of Commerce prices continued to rise, with the exception of the Medium grade. Average prices were: Best $6.91, Medium $6.35, Mixed $5.41; as compared with $6.76, $6.38 and $5.18 in June.

*Pepper.*—Nominal quotations in Singapore were still further marked down during July, and closed at: Singapore Black $8, Singapore White $14, Muntok White $14.50 per picul.

*Nutmegs.*—Prices in Singapore continued unchanged during July, and were $28 and $29 per picul respectively for 110's and 80's.

*Mace.*—Both Siouw and Amboina continued unchanged at the June closing prices of $85 and $70 per picul respectively.

*Cloves.*—There was no change in the nominal quotations of $38 per picul for both Zanzibar and Amboina.

*Cardamoms.*—Green cardamoms were quoted during July in the Ceylon Chamber of Commerce reports at Rs. 1.65 to Rs. 1.76 per lb., rising to Rs. 1.70 to Rs. 1.83 at the close of the month.

## Miscellaneous.

*Derris (Tuba Root).*—Throughout the month a dull and easier market prevailed owing to the seasonal falling off of demand, and prices were marked down from $1 to $2 lower than last month. The average price per picul for July for roots sold on rotenone content was $48, and $33 for roots sold on the basis of ether extract.

*Gambier.*—Prices in Singapore fell still further during July, averaging $4.75 and $9.88 per picul respectively for Block and No. 1 Cube, as compared with $5.19 and $10.38 in June.

*Tapioca.*—Prices in Singapore remained unchanged at: Flake, Fair $5.50, Seed Pearl $5.50, Medium Pearl $6.50 per picul.

*Sago.*—Prices in Singapore improved during July, and averages per picul were: Pearl, Small Fair, $3.92, Flour, Sarawak Fair, $2.44, as compared with $3.89 and $2.25 respectively in the previous month.

*Tobacco.*—Prices for dried locally-grown leaf ranged from $10 to $40 per picul according to grade. Specially prepared leaf in Selangor was quoted at $100, $80 and $60 per picul for 1st, 2nd and 3rd grades respectively.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

*Note.*—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross. London, S.W.1.

# GENERAL RICE SUMMARY*

**June, 1936.**

*Malaya.*—Imports of foreign rice during June were 63,519 tons, and exports 14,461 tons. Net imports for the first half year totalled 260,372 tons, an increase of 17.6 per cent. as compared with 221,322 tons in 1935.†

Of the June imports, 54 per cent. were consigned to Singapore, 15 per cent. to Penang, 7 per cent. to Malacca, 18 per cent. to the Federated Malay States, and 6 per cent. to the Unfederated Malay States. The imports by countries of origin were as follows:—Siam 64.7 per cent., Burma 27.5 per cent., French Indo-China 7.0 per cent., and other countries 0.8 per cent.

Of the exports during June, 79 per cent. were consigned to the Netherlands Indies, and 21 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets): Siam 11,199 (77.4), Burma 2,409 (16.7), French Indo-China 643 (4.4), parboiled 153 (1.1), local production 57 (0.4).

*India and Burma.*—Foreign exports of rice during the first five months of the year totalled 665,000 tons, as compared with 1,023,000 tons in 1935, a decrease of 35 per cent. Of these exports 4.4 per cent. were to the United Kingdom, 21.2 per cent. to the Continent of Europe, 26 per cent. to Ceylon, 18.6 per cent. to the Straits Settlements and the Far East, and 29.8 per cent. to other countries. The corresponding 1935 percentages were 4.7, 12.2, 19.2, 32.9 and 31.

Burma's total exports of rice and bran (*Bangkok Times,* 29th June, 1936) from the 1st January to 2nd May were 1,414,468 metric tons, as compared with 1,549,563 metric tons in 1935, a decrease of 8.7 per cent.

*Siam.*—The latest information was included in the May Summary.

*Japan.*—According to a report received, dated 13th July, 1936, the first Formosan rice crop is estimated to produce 665,599 tons which will constitute a new record.

*French Indo-China.*—Entries of padi into Cholon during the first half of this year totalled 891,556 metric tons, a decrease of 19.1 per cent. as compared with 1,102,656 metric tons in 1935. Exports of rice for the same period decreased by 19.2 per cent., being 951,575 metric tons as compared with 1,177,257 metric tons in 1935.

*The Netherlands Indies.*—The latest information available was published in the February Summary.

*Ceylon.*—Imports during the first half year totalled 270,682 tons as compared with 254,073 tons in 1935, an increase of 6.5 per cent. Of these imports 12.9 per cent. were from British India, 60.8 per cent. from Burma, 0.2 per cent. from

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* Abridged from the Rice Summary for June, 1936, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1935.

the Straits Settlements, and 26.1 per cent. from other countries. The relative percentages for 1935 were 11.7, 71.0, 1.3, and 16.

*Europe and America.*—Shipments to Europe from the East during the period 1st January to 12th June totalled 617,744 tons, an increase of 40.6 per cent. as compared with 439,363 tons in 1935. Of these shipments 36.6 per cent. were from Burma, nil from Japan, 54.6 per cent. from Saigon, 7.3 per cent. from Siam and 1.5 per cent. from Bengal. The corresponding 1935 percentages were 65.4, 3.7, 24.2, 4.3 and 2.4.

Shipments for the Levant from the 1st January to 9th June were 7,553 tons, as compared with 21,678 tons in 1935, a decrease of 65.2 per cent. Shipments for Cuba, West Indies and America from 1st January to 4th June totalled 111,338 tons, a decrease of 4.7 per cent. as compared with 116,790 tons in 1935.

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## MALAYAN PRODUCTION (IN TONS) OF PALM OIL AND KERNELS

(As declared by Estates)

| Month 1936 | Palm Oil | | Palm Kernels | |
|---|---|---|---|---|
| | F.M.S. | U.M.S. | F.M.S. | U.M.S |
| January ... | 1,395.4 | 326.5 | 258.6 | 37.2 |
| February ... | 1,531.9 | 372.4 | 244.2 | 54.6 |
| March ... | 1,878.4 | 534.5 | 302.9 | 88.0 |
| April ... | 1,410.6 | 446.8 | 250.0 | 80.0 |
| May ... | 1,346.1 | 644.8 | 238.1 | 114.6 |
| June ... | 1,557.4 | 658.3 | 245.5 | 100.9 |
| Total ... | 9,119.8 | 2,983.3 | 1,539.3 | 475.3 |
| Total January to June 1935 ... | 6,540.3 | 2,408.3 | 1,019.0 | 345.7 |
| **Total for year 1935 ...** | **17,338.7** | **5,764.6** | **2,711.1** | **818.4** |

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH JUNE, 1936.

| STATE OR TERRITORY | Acreage of Tappable Rubber end 1935 | ESTATES WHICH HAVE ENTIRELY CEASED TAPPING | | ESTATES WHICH HAVE PARTLY CEASED TAPPING (*a*) | | AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED | | Total (3) + (5) | Percentage of (9) to (2) |
|---|---|---|---|---|---|---|---|---|---|
| | | Acreage | Percentage of (3) to (2) | Acreage | Percentage of (5) to (2) | Acreage | Percentage of (7) to (2) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| STRAITS SETTLEMENTS :— | | | | | | | | | |
| Province Wellesley ... ... | 44,526 | 387 | 0.9 | 16,620 | 37.3 | 503 | 1.1 | 17,007 | 38.2 |
| Malacca ... ... ... | 121,601 | 4,775 | 3.9 | 32,107 | 26.4 | 2,871 | 2.4 | 36,882 | 30.3 |
| Penang Island ... ... | 2,575 | Nil | Nil | 569 | 22.1 | 283 | 11.0 | 569 | 22.1 |
| Singapore Island ... ... | 34,525 | 4,275 | 12.4 | 8,916 | 25.8 | 394 | 1.1 | 13,191 | 38.2 |
| Total S.S. ... | 203,227 | 9,437 | 4.6 | 58,212 | 28.7 | 4,051 | 2.0 | 67,649 | 33.3 |
| FEDERATED MALAY STATES :— | | | | | | | | | |
| Perak ... ... ... | 294,988 | 12,123 | 4.1 | 72,760 | 24.7 | 14,685 | 5.0 | 84,883 | 28.8 |
| Selangor ... ... ... | 332,165 | 11,902 | 3.6 | 72,857 | 21.9 | 16,920 | 5.1 | 84,759 | 25.5 |
| Negri Sembilan ... ... | 258,304 | 15,807 | 6.1 | 54,571 | 21.1 | 16,893 | 6.5 | 70,378 | 27.2 |
| Pahang ... ... ... | 77,210 | 9,825 | 12.7 | 27,454 | 35.6 | 17,976 | 23.3 | 37,279 | 48.3 |
| Total F.M.S. ... | 962,667 | 49,657 | 5.2 | 227,642 | 23.6 | 66,474 | 6.9 | 277,299 | 28.8 |
| UNFEDERATED MALAY STATES :— | | | | | | | | | |
| Johore ... ... ... | 432,443 | 37,567 | 8.7 | 66,505 | 15.4 | 40,279 | 9.3 | 104,072 | 24.1 |
| Kedah ... ... ... | 199,607 | 10,352 | 5.2 | 25,115 | 12.6 | 16,109 | 8.1 | 35,467 | 17.8 |
| Kelantan ... ... ... | 30,474 | 403 | 1.3 | 10,357 | 34.0 | 5,283 | 17.3 | 10,760 | 35.3 |
| Trengganu (*b*) ... ... | 4,643 | Nil | Nil | 15 | 0.3 | 179 | 3.9 | 15 | 0.3 |
| Perlis (*c*) ... ... ... | 1,575 | Nil | Nil | 689 | 43.7 | 64 | 4.1 | 689 | 43.7 |
| Brunei ... ... ... | 6,010 | Nil | Nil | 1,603 | 26.7 | 963 | 16.0 | 1,603 | 26.7 |
| Total U.M.S. ... | 674,752 | 48,322 | 7.2 | 104,284 | 15.4 | 62,877 | 9.3 | 152,606 | 22.6 |
| TOTAL MALAYA ... | 1,840,646 | 107,416 | 5.8 | 390,138 | 21.2 | 133,402 | 7.2 | 497,554 | 27.0 |

*Notes* :—(*a*) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(*b*) Registered Companies only.
(*c*) Rendered quarterly.

# MALAYAN RUBBER STATISTICS — TABLE I

## STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JUNE, 1936, IN DRY TONS.

| State or Territory | Stocks at beginning of month 1 | | | Production by Estates of 100 acres and over | | Production by Estates of less than 100 acres estimated 2 | | Imports | | | | Exports including re-exports | | | | Stocks at end of month | | | Consumption 3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | during the month | | January to June 1936 | | during the month | | January to June 1936 | | | | | | |
| | Ports | Dealers | Estates of 100 acres and over | during the month | January to June 1936 | during the month | January to June 1936 | Foreign | From Malay States & Labuan | Foreign | From Malay States & Labuan | Foreign | Local | Foreign | Local | Ports | Dealers | Estates of 100 acres and over | during the month | January to June 1936 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| MALAY STATES :— | | | | | | | | | | | | | | | | | | | | |
| Federated Malay States ... | ... | 7,091 | 11,072 | 10,553 | 57,845 | 4,118 | 27,904 | Nil | Nil | Nil | Nil | 10,181 | 4,999 | 65,621 | 21,321 | ... | 5,708 | 11,936 | 10 | 47 |
| Johore ... | ... | 2,295 | *3,939 | 4,256 | 23,784 | 2,975 | 17,209 | Nil | 115 | Nil | 414 | 2,315 | 4,763 | 13,064 | 27,695 | ... | 2,238 | 4,264 | ... | ... |
| Kedah ... | ... | 351 | 2,521 | 2,551 | 14,921 | 707 | 3,815 | Nil | Nil | Nil | Nil | 1,238 | 1,796 | 8,139 | 11,066 | ... | 238 | 2,858 | ... | ... |
| Perlis ... | ... | 7 | 17 | 9 | 64 | 17 | 110 | Nil | Nil | Nil | Nil | Nil | 26 | Nil | 174 | ... | 4 | 20 | ... | ... |
| Kelantan ... | ... | 254 | 263 | 294 | 1,638 | 420 | 2,984 | Nil | Nil | Nil | Nil | 68 | 650 | 817 | 3,843 | ... | 240 | 273 | ... | ... |
| Trengganu ... | ... | 55 | 50 | 251 | 1,320 | 126 | 661 | Nil | Nil | Nil | Nil | Nil | 377 | Nil | 1,981 | ... | 55 | 50 | ... | ... |
| Brunei ... | ... | 13 | 37 | 48 | 247 | 46 | 331 | ... | ... | ... | ... | ... | 92 | ... | 579 | ... | 3 | 49 | ... | ... |
| Total Malay States | ... | 10,066 | 17,899 | 17,962 | 99,819 | 8,409 | 53,014 | Nil | 115 | Nil | 414 | 13,802 | 12,703 | 87,281 | 66,659 | ... | 8,486 | 19,450 | 10 | 47 |
| S. SETTLEMENTS :— | | | | | | | | | | | | | | | | | | | | |
| Malacca ... | ... | 2,319 | 1,167 | 1,019 | 5,894 | 702 | 3,347 | Nil | | Nil | | 1,908 | | 12,996 | | ... | 2,850 | 1,206 | ... | ... |
| Province Wellesley | ... | 947 | 532 | 412 | 2,335 | 285 | 1,273 | Nil | | Nil | | 6,057 | | 41,341 | | ... | 1,423 | 566 | ... | ... |
| Penang ... | 1,357 | 4,805 | 11 | 18 | 100 | 203 | 537 | 2,878 | 11,455 | 15,069 | 65,185 | | Nil | | Nil | 2,041 | 5,188 | 10 | ... | ... |
| Singapore ... | 3,083 | 17,442 | 176 | 152 | 871 | 271 | 761 | 12,102 | | 70,221 | | 18,282 | | 105,339 | | 2,795 | 18,236 | 160 | 27 | 134 |
| Labuan ... | | 17 | Nil | Nil | Nil | 24 | 98 | 46 | | 430 | | Nil | | Nil | | ... | 15 | Nil | ... | ... |
| Total Straits Settlements ... | 4,440 | 25,530 | 1,886 | 1,601 | 9,200 | 1,485 | 6,016 | 15,026 | 11,455 | 85,720 | 65,185 | 26,247 | Nil | 159,676 | Nil | 4,836 | 27,712 | 1,942 | 27 | 134 |
| Total Malaya ... | 4,440 | 35,596 | 19,785 | 19,563 | 109,019 | 9,894 | 59,030 | 15,026 | 11,570 | 85,720 | 65,599 | 40,049 | 12,703 | 246,957 | 66,659 | 4,836 | 36,198 | 21,392 | 37 | 181 |

*Amended

### TABLE II
### DEALERS' STOCKS, IN DRY TONS 3

| Class of Rubber | Federated Malay States | S'pore | Penang | Province We'sly D'dings M'cca. | Johore | Kedah |
|---|---|---|---|---|---|---|
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| DRY RUBBER | 4,711 | 17,520 | 4,887 | 3,794 | 2,007 | 139 |
| WET RUBBER | 997 | 716 | 301 | 497 | 231 | 99 |
| TOTAL ... | 5,708 | 18,236 | 5,188 | 4,291 | 2,238 | 238 |

### TABLE III
### FOREIGN EXPORTS

| PORTS | For month | January to June 1936 |
|---|---|---|
| 29 | 30 | 31 |
| Singapore ... | 25,844 | 157,103 |
| Penang ... | 8,984 | 60,088 |
| Port Swettenham. | 5,049 | 28,376 |
| Malacca ... | 172 | 1,390 |
| MALAYA ... | 40,049 | 246,957 |

### TABLE IV
### DOMESTIC EXPORTS 4

| AREA | For month | January to June 1936 |
|---|---|---|
| 32 | 33 | 34 |
| Malay States ... | 26,505 | 153,940 |
| Straits Settlements | 2,883 | 14,113 |
| MALAYA ... | 29,388 | 168,053 |

*Notes* :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Column (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24th July, 1936.

# METEOROLOGICAL SUMMARY, MALAYA, JUNE, 1936.

| Locality. | Air Temperature in degrees Fahrenheit | | | | | | | Earth Temperature | | Rainfall | | | | | | | Bright Sunshine. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Means of | | | Absolute Extremes | | | | | | Total. | | Most in a day. | Number of days. | | | | Total. | Daily Mean. | Per cent. |
| | A. Max. | B. Min. | Mean of A and B. | Highest Max. | Lowest Min. | Lowest Max. | Highest Min. | At 1 foot | At 4 feet | | | | Precipitation .01 in or more | Precipitation, .04 in or more | Thunder-storm | Fog morning obs. | Gale force 8 or more | | | |
| | °F | °F | °F | °F | °F | °F | °F | °F | °F | in. | mm. | in. | | | | | | Hrs. | Hrs. | |
| Railway Hill, Kuala Lumpur, Selangor ... | 91.3 | 71.5 | 81.4 | 96 | 68 | 82 | 74 | 84.6 | 85.3 | 4.41 | 112.0 | 1.55 | 13 | 9 | 4 | 1 | | 203.00 | 6.77 | 55 |
| Bukit Jeram, Selangor ... | 88.5 | 72.6 | 80.5 | 91 | 70 | 84 | 75 | 84.5 | 86.9 | 7.00 | 177.8 | 2.60 | 9 | 8 | 1 | 1 | 3 | 234.95 | 7.83 | 64 |
| Sitiawan, Perak ... | 89.3 | 72.6 | 80.9 | 93 | 67 | 82 | 75 | 84.3 | 84.9 | 4.66 | 118.4 | 1.09 | 8 | 7 | | | | 215.75 | 7.19 | 58 |
| Temerloh, Pahang ... | 89.5 | 71.8 | 80.7 | 93 | 68 | 80 | 74 | 85.8 | 86.5 | 7.54 | 191.5 | 2.24 | 14 | 12 | 4 | 10 | 1 | 201.85 | 6.73 | 55 |
| Kuala Lipis, Pahang ... | 89.4 | 70.8 | 80.1 | 93 | 68 | 76 | 74 | 84.3 | 85.1 | 6.51 | 165.4 | 2.04 | 13 | 12 | 2 | 13 | 3 | 199.85 | 6.66 | 54 |
| Kuala Pahang, Pahang ... | 87.0 | 73.6 | 80.3 | 90 | 70 | 81 | 77 | 85.6 | 86.6 | 6.94 | 176.3 | 1.36 | 19 | 14 | | | 2 | 215.65 | 7.19 | 58 |
| Kallang Aerodrome, S'pore ... | 86.1 | 76.6 | 81.3 | 89 | 72 | 81 | 82 | 83.2 | 84.5 | 3.65 | 92.7 | 0.82 | 16 | 11 | 1 | | 1 | 196.95 | 6.57 | 54 |
| Butterworth, Province Wellesley ... | 87.6 | 73.6 | 80.6 | 91 | 72 | 84 | 76 | 85.8 | 86.5 | 6.69 | 169.9 | 4.27 | 16 | 13 | | | 1 | 199.25 | 6.64 | 53 |
| Bayan Lepas Aerodrome Penang ... | 87.8 | 73.4 | 80.6 | 91 | 71 | 84 | 75 | 84.4 | 85.1 | 5.21 | 132.3 | 2.15 | 12 | 11 | | | 3 | 186.70 | 6.22 | 50 |
| Bukit China, Malacca ... | 85.5 | 73.8 | 79.7 | 88 | 70 | 83 | 76 | 84.0 | 84.9 | 6.58 | 167.1 | 1.65 | 13 | 11 | 4 | | | 199.60 | 6.65 | 54 |
| Kluang, Johore ... | 88.5 | 71.1 | 79.8 | 92 | 69 | 79 | 72 | 82.3 | 82.9 | 5.10 | 129.5 | 1.86 | 14 | 10 | 4 | 8 | | 172.35 | 5.75 | 47 |
| Bukit Lalang, Mersing, Johore | 87.2 | 71.8 | 79.5 | 91 | 70 | 79 | 75 | 82.5 | 82.4 | 5.18 | 131.6 | 0.68 | 21 | 17 | 6 | 1 | 2 | 198.95 | 6.63 | 54 |
| Alor Star, Kedah ... | 87.7 | 74.0 | 80.9 | 91 | 72 | 82 | 77 | 86.2 | 86.8 | 4.32 | 109.7 | 1.70 | 13 | 10 | 1 | | | 181.15 | 6.04 | 48 |
| Kota Bahru, Kelantan ... | 89.1 | 73.8 | 81.5 | 92 | 70 | 82 | 76 | 84.4 | 85.1 | 6.31 | 160.3 | 2.07 | 10 | 9 | 3 | | | 193.55 | 6.45 | 52 |
| Kuala Trengganu, Trengganu | 88.3 | 73.0 | 80.7 | 90 | 69 | 79 | 76 | 83.6 | 84.8 | 5.00 | 127.0 | 1.30 | 12 | 10 | 5 | | | 217.85 | 7.26 | 59 |
| HILL STATIONS. | | | | | | | | | | | | | | | | | | | | |
| Fraser's Hill, Pahang 4268 ft. | 76.0 | 63.0 | 69.5 | 79 | 61 | 69 | 66 | 72.3 | 73.1 | 4.56 | 115.8 | 0.95 | 16 | 12 | 1 | 10 | | 190.70 | 6.36 | 52 |
| Cameron Highlands, Tanah Rata, Pahang 4750 ft. ... | 72.7 | 54.5 | 63.6 | 76 | 47 | 68 | 62 | 70.5 | 70.4 | 5.00 | 127.0 | 1.20 | 14 | 14 | 2 | | 3 | 191.80 | 6.39 | 51 |
| Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ... | 72.0 | 59.3 | 65.7 | 76 | 57 | 65 | 61 | | | 4.88 | 124.0 | 1.26 | 15 | 13 | 2 | | 4 | 197.55 | 6.59 | 53 |

Compiled from Returns supplied by the Meteorological Branch, Malaya